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TECH. OPNS. IN THE
EAST LUFTWAFFE SIS

TOP SECRET

THE SIGNAL INTELLIGENCE SERVICE

OF THE

GERMAN LUFTWAFFE

VOL. XII

TECHNICAL OPERATIONS IN THE EAST

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VOL. XII

TECHNICAL OPERATIONS IN THE EAST

LUFTWAFFE SIS

F O R E W O R D

Contained in this volume are discussions pertaining to the characteristics of the radio traffic and cryptographic systems employed by the Russian air forces during the course of World War II, as known to the Signal Intelligence Service of the German Luftwaffe.

It is to be observed from a study of these discussions that the signal communication equipment of the Russians was inferior to that of the western Allies. Particularly lacking to the Russians was VHF and radar equipment, and, in consequence (especially during the latter phases of the war), the signal communication techniques employed on the Eastern Front seem comparatively primitive. It must be emphasized, however, that these circumstances rendered the tasks of the Luftwaffe Signal Intelligence Service in the East no less difficult, since, as revealed in the studies dealing with operations in the West, the SIS derived its most precise intelligence from the interception of VHF and airborne radar transmissions.

A conspicuous feature of SIS operations in the East was that of mobility, a requirement continuing throughout the entire war, and which, in the very nature of things, adversely affected the quality of its work. In this respect the SIS of the West particularly enjoyed a huge advantage, since it operated for so long a period from fixed installations.

J.G. SEABOURNE.
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VOL. XII

TECHNICAL OPERATIONS IN THE EAST

LUFTWAFFE SIS

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PART ONE

EVALUATION

By

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I. Introductary

Within the Luftwaffe SIS the principles and procedures underlying traffic evaluation did not differ materially as between the West, South and East. Indeed, it is not believed that these principles differ to any appreciable degree as between all signal intelligence services. In consequence it is not the purpose of this study to emphasize the principles of final evaluation as such, but rather to discuss the distinctive features of radio traffic encountered by the Luftwaffe SIS on the Eastern Front, and the manner in which it was processed.

II. Personnel

The personnel of the evaluation sections of all the SIS battalions on the Russian Front comprised the following types of specialists:

Final evaluators (it was found most advantageous, when possible, to arrange for these specialists to work for short periods in the office of the Luftflotten A-2's, where they were able to gain an appreciation of signal intelligence in relation to other forms of intelligence, as well as to complement their knowledge of the enemy situation in general).

Specialists on the various Russian Army "fronts" (Army Groups), such as "1st White Russian Front", 3rd Ukranian Front", etc.

Translators

Liaison officers from the German Army SIS and the Weather Service.

Grid Specialists

Specialists on "form" messages (stereotyped messages containing warning reports, status of equipment, airfield serviceability, etc.).

Card-Index clerks

Clerk-typists

Draftsmen

III. Records

Statistical material contained in a card index file was a most important aid to evaluation. This file contained all information known of the enemy, and included the number of his units, and their organization, their record in the war to date, location of airfields and names of important personalities. Naturally these records were guarded very carefully and their safety looked to during air raid alarms or other perilous situations.

A. Air Forces Index

This was the most important file of the evaluation section. It listed all known units of the Russian air forces, there being a separate card for each unit. All data, such as assignment, strength, equipment, movements, etc., were entered with date, and reference to the traffic from which the information was obtained. Information not originating with the SIS (for example, prisoner of war interrogations, agents' reports, etc.) was entered in distinctive color.

B. Name Index.

This file contained all names appearing in connection with the various Russian air force units. The Russian habit of signing all radio messages with

the name of the commanding officer, and the frequent use of the names of pilots and ground officers resulted in a voluminous file. It was one of the most important means for the identification of call-signs and units. It did not matter how often the enemy changed call-signs, for since the use of proper names in messages continued, units could easily be identified. The Russians recognized the danger of this procedure comparatively late, when they finally adopted cover-names and numbers. However, the rule was not fully complied with, so this valuable source of information remained available to the SIS until the end of the war.

C. Airfield Index

This file contained a list of all Russian airfields known, with a description of size, length of runway, number of revetments, strength of flak, etc.. After an airfield had been covered by photo-reconnaissance, a target number, assigned by the Luftflotte, was entered on its card.

IV. Analysis and Evaluation of Special Traffic

A. Russian Grid Systems

All messages in which names of localities were given in grid references were handled by a grid specialist.

Russian grid references were usually expressed by a 6-figure group with a letter frequently added. This grid reference was often used to inform Russian air units of the bomb-line. Since the operational sectors of individual Russian units were known, and since the Russian and German front lines were one and the same, an entry into this grid system was easily accomplished. The breaking of this map code was further facilitated by the fact that the Russians, in order to specify a location more definitely, often put the first, or the first and the last letters of the encoded name at the end of the figure group (e.g., Nicolayev - 412312N;

Tarnov - 524394Tv). Another point of entry in breaking these grid references was that in the case of a string of encoded locations a reference to terrain elevation was usually left unencoded.

The two most prevalent grid systems were:

1. Enciphered longitudinal and latitudinal references, used in connection with small-scale maps, and valid for the entire Eastern Front.
2. The Gauss-Krueger system in connection with large-scale maps, used only on certain sectors of the front.

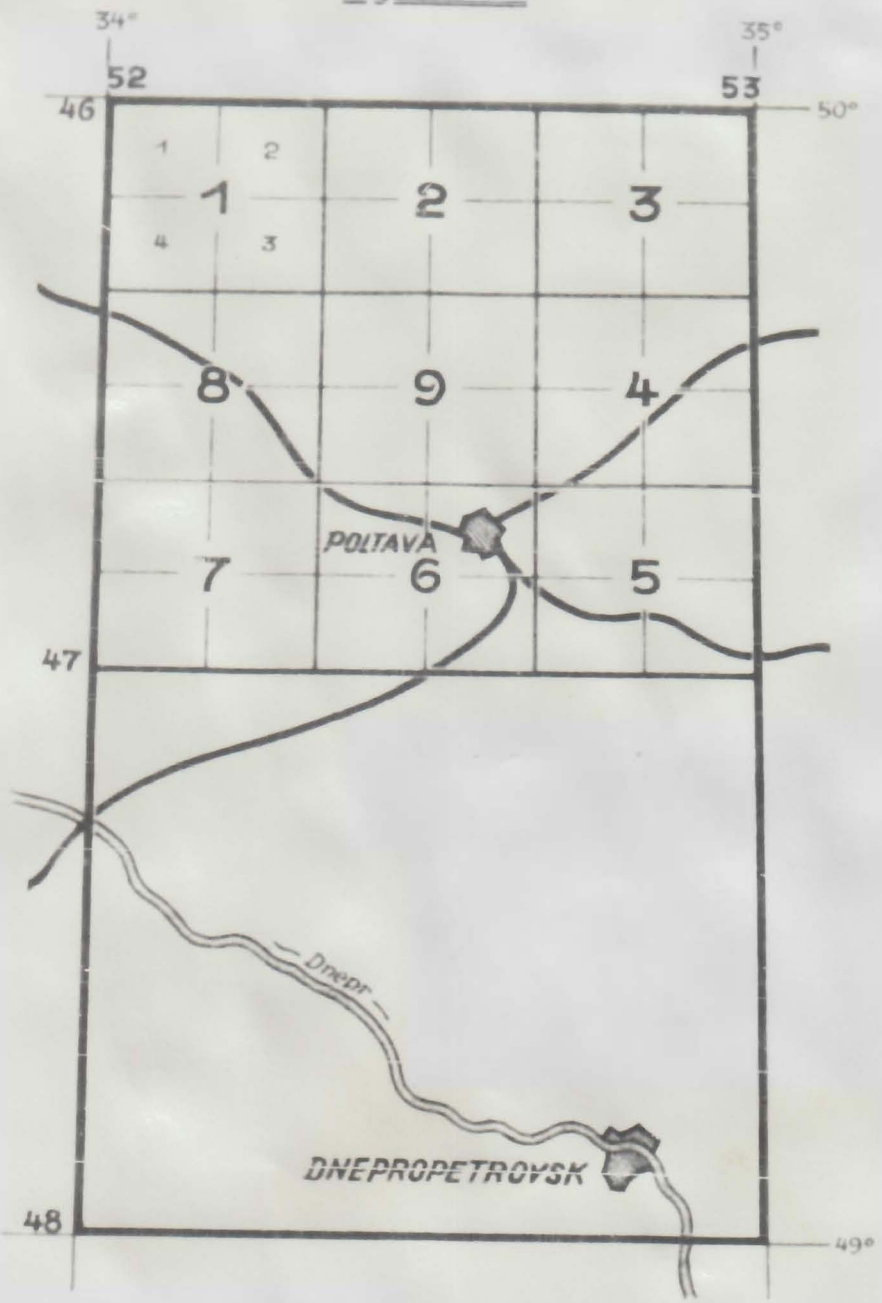
The first system was used by the Russian Air Raid Warning Service, and by long range bombers, while the second was used by the tactical aviation units, and had many variations.

The following is an example of the system by the Russian Air Raid Warning Service: the entire map was divided into "large", "small", and "smallest" squares. A "large" square comprised one degree of longitude and one-half degree of latitude. Longitudinal and latitudinal references were expressed in a code, which usually changed monthly. A "large" square was divided into nine "small" squares, while the "small" squares, in turn, were subdivided into four "smallest" squares. One digit numbers were used to designate the "small" and the "smallest" squares. These numbers for the squares remained constant and ran clockwise, beginning in the upper left-hand corner. The longitudinal and latitudinal reference of the "large" square was expressed by the co-ordinates of its upper left hand corner. Thus as shown in Figure No. 1, the encoded reference for the city of Poltava would be 465262.

The Gauss-Krueger system was a much similar grid, the primary difference being that the dimensions of the "large" squares were selected arbitrarily by the

— Russian Grid System —

Figure No.1



Note. The numbers shown in red are the actual longitude and latitude reference, those in black are in encoded equivalents.

individual units using the system. From the SIS standpoint, the size of these squares could be determined only through experience. The system of numbering the "small" and "smallest" squares was the same.

The method of encoding the co-ordinates used to designate a large square varied with each Russian air army, and often even with units within an air army. Further difficulty for the SIS was occasioned by the fact that the coded equivalents for longitude and latitude did not always run regularly from west to east and north to south, but sometimes in the opposite order; also some units might choose to use all even numbers, other all odd numbers.

In some systems the "large" squares were not encoded by numbers, but with a code name (e.g. "lipa" = linden tree). Thus an encoded reference might read not "425391", but "lipa 91".

In still another grid system, longitude was expressed by two numbers, and latitude by three. The next reference referred to the "smallest" square, the "small" squares being omitted; thus, this system still resulted in a 6-figure reference. This grid was used only in conjunction with large-scale maps.

B. Pre-arranged Form Messages

Russian pre-arranged form messages were handled by an individual specialist of the evaluation company. These messages had the following characteristics, in which they differed from other types of traffic:

1. They contained, in the clear, the words "pervoe" (firstly), "vtoroe" (secondly), "tretie" (thirdly), etc., which indicated the type of report being rendered.

2. They contained numbers in consecutive order, which indicated the subject on which a report was being rendered.

3. These were followed by groups of irregular numbers, which indicated strength of personnel, weight or quantity of equipment, etc.

The following is an example of a typical pre-arranged form message:

Message:	pervoe	03			835	
Meaning:	On hand:	high octane fuel			835	Kilos
Message:	04	1620		05	000	
Meaning:	Motor fuel	1620	Kilos	oil	0	Kilos
Message:	06	11350		07	4800	
Meaning:	M/G ammo	11350	rounds	A/C ammo	4800	rounds
Message:	vtoroe	03			1560	
Meaning:	Required:	high octane fuel			1560	Kilos
Message:	04	730		05	200	
Meaning:	Motor fuel	730	Kilos	oil	200	Kilos
Message:	06	11500		07	2300	
Meaning:	M/G ammo	11500	rounds	A/C ammo	23000	rounds

Daily reports of this type indicating stocks of rations, ammunition and fuel, condition of airfields, changes in personnel strength, etc., were made by subordinate units to their superior commands.

Pre-arranged form messages of combat aviation units contained, for the most part, details as to strength, location, operational status of aircraft and crews,

and seldom gave any information as to operations, duration of flights, or losses. Any grid locations mentioned in such messages were encoded. The following is an example of such a message:

Message:	01	195		02
Meaning:	regiment	195		location
Message:	524313	03		31
Meaning:	Ivanovka	aircraft		31
Message:	365	04		25
Meaning:	type IL-2	serviceable		25
Message:	05	6	07	34
Meaning:	unserviceable	6	pilots	34
Message:	08	37		
Meaning:	aerial gunners	37		

In addition to their valuable contents, these messages were an important aid to the identification of call-signs and networks. Even when call-signs were changed daily, a unit was easily identified through this information as to numbers of aircraft and crews, and quantities of oil, fuel and ammunition, which were given in the clear. Since the form of these message usually remained constant for seven to fourteen days, it was only necessary to refer to a similar message of the previous day in order to recognize the unit, and therewith to identify the call-sign.

Daily summaries and operations reports of combat aviation units were also reported by pre-arranged form messages. Numbers in these messages were encoded, but in such simple form, however, that speedy analysis was possible. The numbers 0 to 9

were enciphered by three-digit numbers from a prescribed group of 100 numbers (for example, 812 = 1, 817 = 2, 831 = 3, 854 = 4, etc.). The various types of aircraft were encoded with other three-digit numbers from another group of 100 numbers (for example, LA-5 = 507, IL-2 = 513, IL-4 = 514, A-20 = 515, Liberator = 524, JU 88 = 532, etc.). Designations of types of units (fighter, fighter bomber, reconnaissance, etc.) were encoded within another one hundred-number group. The code numbers were changed frequently, but the order of meanings within each hundred-number group remained constant. It was therefore usually sufficient to identify one meaning only in order to re-establish the whole sequence of meanings within a hundred-number group.

This system was also used by Russian long range bombers in their strength reports, and by the Russian Air Raid Warning Service. It was valid for the whole Eastern Front, and therefore of the greatest importance to all the SIS battalions, which competed with each other in an attempt to be the first to break a new addition of this code.

C. Weather Messages

Encoded weather messages were given directly to the weather liaison officer. These could be easily identified by their preamble, by the random use of the letter "X" within the text of the message, and by the absence of message numbers and delivery groups. Weather messages in clear text, which were quite frequent at the beginning of the war but became rarer later on, were translated into German before they were given to the liaison officer.

The weather liaison officer deciphered messages by means of a deciphering table which was broadcast every six hours from the office of the Chief of the Luftwaffe Weather Service. Weather messages were of assistance in identifying the

geographical origin of other traffic intercepted on the same networks, since the weather messages often mentioned meteorological stations together with their locations.

V. Russian Air Armies

A. General

Unlike the German Luftwaffe, the Russian air components, under the command of Chief Marshal Novikov, were not an independent branch of the Russian armed forces, but were an integral part of the Red Army. The operations of these air units were confined primarily to tactical air support of the Army. They were therefore an instrument of the Army, operating according to Army needs. Actual command of Russian air units during operations was in the hands of ground force commanders, the air force commanders acting in advisory capacity, On the other hand, air force commanders were solely responsible for the execution of air missions. The very structure of the Russian air organization emphasizes its purport as an instrument of the Army. Of 12,000 Russian aircraft identified by the Luftwaffe SIS during the war (long range bombers and naval aircraft excluded), almost 10,000 (more than eighty percent) were fighters and fighter bombers. The remaining twenty percent were bombers; but even these operated in the main against front-line targets. Only rarely did they attack German airfields or communications targets lying to the rear.

B. Organization (See Figure No. 2)

The air units of the Red Army were organized in air armies. At the end of the war there were eleven Russian air armies in operation along the Eastern Front. Their designation, from south to north, was as follows: 17th, 5th, 8th, 2nd, 6th, 16th, 4th, 1st, 3rd, 15th and 7th Air Armies. One air army was assigned to each army group, to which it was operationally subordinate. The air armies were subdivided into corps, divisions, regiments and escadrilles. According to the impor-

Comparative Organizational Strength of German and Allied Air Forces

Figure No. 2

German Air Force		USAAF		RAF		USSR	
Staffel	A/C 9–12	Flight	A/C 8–12	Flight	A/C 8–12	Escadrille	A/C 8–10
Gruppe (3 Staffeln)	27–30	Squadron	20–30	Squadron	20–30	Regiment	ca. 30
Geschwader (3 Gruppen)	ca. 80 –90	Group	70–90	Wing	70–90	Division (2–5 Regiments usually 3)	60– 150
Fliefü. Jafü. (2 Geschwader)	ca. 160	Wing	210– 360	Group	according to mission		
Fliegerdivision	ca. 320	Command (2 or more wings)	700– 1500			Corps (2 or 3 Divisions)	120– 450
Fliegerkorps (2 or 3 Divisionen)	ca. 600 –900						
Luftflotte		Air Force		Command or TAF		Air Army	

tance of its task an air army had from two to eight corps. Originally these corps comprised mixed fighter, fighter bomber and bomber units. During the war a trend was noted to change these mixed corps into uniform corps, and by the end of the war there was only one mixed corps (VI Corps) left on the Eastern Front. However, many divisions within corps that had been designated as uniform were mixed. Each corps comprised two or three divisions, the divisions two or three regiments each. Each regiment was divided into three escadrilles, which, with the exception of a few reconnaissance escadrilles, did not appear independently in the radio traffic.

Reconnaissance and artillery observation aircraft, as well as transport units, were occasionally organized as escadrilles, but were usually regiments, and were directly subordinate to the air armies. Each air army normally had one reconnaissance and one artillery observation regiment. Air armies in areas where preparations for a concentrated attack were under way were often reinforced by one or two additional reconnaissance regiments. By noting such reinforcements, Russian intentions could frequently be determined.

C. Strength

The strength of the Russian air armies on the Eastern Front at the end of the war, as determined from signal intelligence, is shown by the following table:

	Corps	Divisions	Regiments
Fighter bomber	11	38	127
Night ground attack	0	10	27
Fighter	10	48	171
Bomber	5	21	63
Reconnaissance	0	0	13
Artillery observation	0	0	6
Mixed units	1	5	0

According to Russian strength reports, which indicated an average of thirty aircraft per regiment, the total number of Russian aircraft in support of the Army at the end of the war was approximately 12,000, which for operational purposes were divided approximately as follows:

Fighter bombers	3800
Night ground attack	800
Fighters	5100
Bombers	1900
Reconnaissance	400
Artillery observation	200

These figures do not include long range bomber units and naval aircraft.

D. Aircraft Types

1. Fighter Bombers

The standard type aircraft of Russian bomber units was the strongly armored IL-2, named after its designer, Ilyushchin. The number on hand, as well as the rate of production of this type aircaft were both very high. Originally designed as a single-seater, heavy losses were encountered. Therefore, with their typical gift for improvisation, the Russians simply cut another seat for a gunner in the fuselage of the aircraft. A rearward-pointing machine gun was installed. These modifications were adopted by the Russian aircraft manufacturing industry, and by the end of the war almost all IL-2's were two-seater aircraft.

This change resulted in a sudden scarcity of aerial gunners. The problem was solved by taking every available soldier from the ground forces who had never had any experience at all with an aircraft, and giving him a very short course of training as an aerial gunner. For this reason, as well as because of the weak armor

surrounding the gunner's position, casualties were very high, and prisoners of war often referred to the assignment as an aerial gunner as a "ticket to heaven". This was probably true as many pilots were found to have been punished by assignments as aerial gunners.

The Russian night ground attack aircraft was the PO-2. Its previous designation as U-2 was changed in August, 1944, in tribute to its designer, Polikarpov. The former designation signified "utchebny" (training aircraft), and as such it had been used exclusively. Here again the Russian gift for improvising came to the fore. After the Luftwaffe had almost completely annihilated the Russian air forces at the beginning of the war, all Russian training aircraft were taken out of the schools and thrown into battle. They were used as auxiliary bombers, and the bombs were released by hand.

This type of aircraft boasted good performance records, could land anywhere, and proved itself especially in night operations. Even when newer and better types were available in sufficient numbers, the PO-2 remained in action. It was further improved, and even newly-activated units were equipped with it. German soldiers on the Eastern Front humorously called it a "sewing machine", but the aircraft often responded to this epithet in not so humorous a fashion.

2. Fighters

Most fighter units were equipped with Yakovlev (Yak-1,3,7,9) and Lavotschkin aircraft (LA-5 and 7). The newer models of these aircraft equalled the German ME-109 and FW-190 in speed, armament and performance.

The only aircraft of foreign manufacture used at the front, and that on a small scale only, was the Bell P-39, Airacobra. Difficulties in replacement was probably the reason for the limited use of this aircraft type, although Russian

prisoners often stated that they did not like to fly foreign type aircraft.

3. Bombers

The most prevalent type of bomber was the PE-2, named after its designer, Petlyakov. The majority of daylight bombers were of this type. A later model, the PE-3, appeared at the front for a short time only and then disappeared as it obviously was not a success.

Prisoners of war predicted a great future for the TU-2 bomber, designed by Tupolev, which had occasionally been mentioned in Russian radio traffic in the last year of the war. The Luftwaffe SIS was unable to identify a single unit at the front completely equipped with this type of aircraft.

The American Douglas A-20, Boston III, was also extensively used.

4. Reconnaissance Aircraft

Close reconnaissance units were primarily equipped with the fighter, Yak-9, with built-in camera; on occasion also with the IL-2. Quite frequently messages intercepted from U-2 units indicated that this type of aircraft was being used for night reconnaissance. The PE-2 was employed exclusively on long range reconnaissance.

5. Artillery Observation Aircraft

Fighter types, and occasionally IL-2's, were used for artillery observation and fire control.

E. Air Support Tactics

The monitoring of Russian air combat units not only brought the strategic results mentioned above, most of which were obtained from pre-arranged form messages and other types of daily reports, but also intelligence of immediate tactical value.

In this latter connection, the prime source of such intelligence was the requests for air support originating with air liaison officers at army and motorized corps headquarters.

These messages requesting air support appeared in the point-to-point networks between air armies and their air corps and independent air divisions, and were transmitted almost exclusively by radio. Since these messages could be read by the Luftwaffe SIS, the German Command was currently informed of those targets for which air support had been requested.

By the time that operational instructions were given to an air division by an air corps, which instructions were again intercepted by the SIS, German troops had been warned and countermeasures taken.

These air support messages were of particular value to the German Army units because:

1. By virtue of the close co-operation between Russian air and ground forces, a ground attack could be expected whenever strong air support was requested.
2. Air liaison officers reported their locations in these messages, thus revealing the position of Russian army and corps headquarters (ground forces) at which they were stationed.
3. From ground situation reports, which were usually transmitted by the air liaison officers several times a day, an accurate picture of the frontal sector of each Army unit could be obtained.

Results of Russian reconnaissance, which were communicated to the air liaison officers by radio, indicated to what extent German strong or weak points had been observed.

The air divisions currently reported to the air corps or air armies the number of their aircraft which had taken off or landed incidental to missions. These reports allowed Russian losses to be computed, and gave the German Command a clear picture of the current air situation, making costly patrol flights unnecessary. German fighter units only took off when SIS reports indicated that there was a chance of contacting the enemy.

Furthermore, SIS R/T out-stations, as well as German radar stations, could be alerted on the basis of reports of Russian aircraft taking off, thereby improving their efficiency.

VI. Air Defense Forces

A. Organization

The PVO (protivovosduschnaya oborona = air defense) air units were fighter units which operated in defense of the Russian hinterland. Similar to the air units on the front, they were organized into regiments, divisions and corps, but were not under the command of the air armies.

It is interesting to note that a great many women were employed as pilots in these PVO units, and according to Russian press reports were credited with shooting down a number of German aircraft.

B. Strength

Four corps, six divisions, and forty-two regiments were identified by the SIS. The PVO regiments were considerably stronger than those at the front. Prearranged form messages from PVO divisions to corps often referred to a regimental strength of forty-five or more aircraft. An estimated average strength of forty aircraft per regiment would therefore not be too high.

C. Aircraft Types

In contrast to the air units at the front, PVO units were equipped more frequently with Allied aircraft types, such as Airacobras, Kittyhawks, Spitfires and Hurricanes.

Russian obsolete types no longer used at the front were employed by the PVO units. Among these were the MiG-3 and LaGG-3. The MiG-3 was designed by Mikoyan and Guryevitsch, while the LaGG-3 was the composite creation of Lavotschkin, Gorbunov and Gubkov.

Interception of PVO radio traffic did not give a complete picture, since Russian land-line communication in the rear areas was adequate, and very few radio messages were necessary. However, the German Command was not much interested in details of the defense organization of the Russian interior, since as the war progressed German long range bomber raids became most infrequent. During German long range reconnaissance missions, radio traffic of the PVO units was monitored, and warnings given to the pilots.

Perhaps the most important results obtained from the monitoring of PVO traffic were the aircraft recognition signals thus secured. These signals were valid for the entire Eastern Front, and were usually intercepted in PVO messages two or three days in advance of their use on the front. In several cases, German reconnaissance aircraft eluded Russian fighters by the use of these signals.

VII. Russian Naval Air Units

A. General

The Russian Navy had its own independent air force, which had the following duties:

1. The protection of Russian naval units and their bases.
2. The support of naval operations.
3. To combat enemy naval forces.

Crews were trained in naval air force schools (VMAU = voyenno-morskoye-aviazionnoye-utschilischtsche).

B. Organization

The German SIS in the East only monitored the air traffic of those Russian naval forces which were in a position to operate against the Germans. These were:

1. The Black Sea Fleet Air Arm.
2. The Baltic Fleet Air Arm.
3. The Artic Fleet Air Arm.

Each of these units had its own fighter, fighter bomber, bomber, torpedo bomber, mine-laying, and reconnaissance aircraft, which were organized similarly to the air units of the Red Army. Corps did not exist in the fleet air arms, a division being the largest unit, consisting of three to six regiments.

Mine-laying and torpedo bomber aircraft were a specialty of the Naval Air Force. Their crews were specially trained in the laying of mines and aerial torpedo attacks.

The bomber regiments were trained principally in dive-bombing techniques, and were primarily used as such.

The fighter bomber regiments were used in support of Russian naval landing operations.

Fighter regiments were used for the protection of base installations (harbors, docks, etc.), and also flew fighter cover for the bomber and fighter bomber units.

C. Strength

The strength of Russian naval aviation used against the Germans is shown in the following table:

1. Black Sea Fleet Air Arm

	Fighter	Bomber	Mine-Torpedo	Fi. Bomb.	Recce.
Divisions:	1	2	0	0	0
Regiments:	5	4	0	0	1
Total A/C:	150	120	0	0	30

2. Baltic Fleet Air Arm

Divisions:	1	0	1	2	0
Regiments:	9	1	2	4	1
Total A/C	270	30	60	120	30

3. Artic Fleet Air Arm

Divisions:	1	1	0	0	0
Regiments:	5	1	2	1	1
Total A/C:	150	30	60	30	30

On a basis of an average of 30 aircraft to a regiment, the Russian Fleet Air Arms operating against Germany at the end of the war had a total of 1150 aircraft of which there were:

Fighters:	550
Bombers:	200
Mine-laying & torpedo bombers:	100
Fighter bombers	200
Reconnaissance A/C	100

Since the interception of Russian naval aviation traffic by the Luftwaffe SIS was quite thorough, the figures given here probably correspond quite accurately to the actual strength of these units.

D. Aircraft Types

Fighter and fighter bomber units, similar to those of the air forces of the Red Army, were equipped with aircraft of the LA and Yak series, as well as with IL-2's.

The bomber units, corresponding to their primary mission of attacking shipping from low altitudes, were equipped exclusively with the dive-bomber PE-2, which had diving brakes, and an automatic device for leveling off.

The mine-laying and torpedo bomber units used the American A-20, Boston III. Model "G" of this type had been re-equipped for mine-laying and torpedo functions, and had a capacity of 1350 kilos of mines, or one or two torpedos.

The reconnaissance units were equipped primarily with PE-2's and Boston III's. Occasionally a small number of American PBY's (Catalinas) were observed with the Artic Fleet.

The Russian flying boats MBR-2 (Morskoi Blishni Rasvedtschik = Naval Reconnaissance Aircraft), and MDR-1 (Morskoi Dalni Rasvedtschik = Long Range Naval

Reconnaissance), which were used for reconnaissance at the beginning of the war later became obsolete. The few aircraft of this type which were still available were used for air sea rescue work.

The Russians, therefore, did not have a single purely naval type aircraft, which was suitable for combat. Even their carrier aircraft, KOR-1 (Korabelni Samolet) was completely obsolete and not used for combat. So far as was known, no new type of Russian naval aircraft was under development.

The intelligence obtained by the Luftwaffe SIS was derived primarily as a result of solving the call-sign recipherment table used by Russian naval aviation. The Russians foolishly kept this recipherment table in use for more than a year with the result that it was completely reconstructed by the SIS. From these call-signs not only air units could be identified, but also the naval units with which they worked. The bases of the air units were determined by D/F. Take-off messages from naval air regiments, and reconnaissance reports could be read in ample time to warn German submarines and convoys.

VIII. Civil Aviation

Russian civil aviation (GVF = Frashdanski Vosduschny Flot) was organized in regiments. At the beginning of the war it had given up its best pilots to the long range bomber forces, and during the war it was devoted exclusively to transport tasks.

The principal aircraft types used were the LI-2 (Lissitschanski), a model of the Douglas DC-3 which previously had been designated as the PS-84 (Passashirski Samolet = transport aircraft); and the Yak 6, which had a capacity of 520 kilos or six persons.

Traffic of the Russian civil air fleet was not systematically intercepted by the Luftwaffe SIS, and the small quantity of messages available did not yield any significant intelligence.

IX. Russian Air Service Command

A. General

From signal intelligence it was evident that Russian air service units, despite the fact that they had to work with equipment inferior to that of their German counterparts, performed in an excellent manner their tasks of servicing tactical units, and constructing and supplying air bases. In no case, even during periods of muddy weather and during the severest winter, could an interruption of aerial operations be attributed to these service units. German Luftwaffe commanders always marvelled at an admired the speed with which Russian air units were able to transfer their bases in the wake of advances by the Russian ground forces; this could only be attributed to the efficient work of these air service units.

B. Organization

The largest unit of the Air Service Command was the District Air Base Depot (RAB = Rayon Aviazionnago Basirovaniya), and, in the case of the Naval Air Force, the Naval Air Base Depot (MAB = Morskaya Aviabasa). The Army units were subordinate to the quartermaster generals of the various air armies, and were comparable to the German Regional Air Base Depots.

As a rule each Russian air army had 3-5 of these district air base depots, but in critical sectors there were often as many as 10.

A district air base depot comprised the following subordinate units:

1. 3-5 Airfield Battalions (BAO = Batalyon aerodromnogo obslushivaniya) which the most important units within the air service command. Each airfield battalion serviced one or more airfields, for the construction, maintenance and supply of which it was responsible. It had no administrative ties with the tactical unit or units occupying its airfields and did not move with them.
2. 1-2 Engineer Battalions (IAB = Inshenerno Aerodromny Batalyon) which were charged with the construction of new airfields.
3. 1 independent Transport Battalion (OATB = Otdelny Avtotransportny Batalyon) which was charged with the transportation of all supplies. It was designated by the number of its district air base depot plus "100" (for example, 16 RAB = 116 OATB).
4. 1 independent Signal Company (ORS = Otdelnaya Rota Svyasi) which maintained signal communication and was designated by the same number as its district air base depot.
5. Repair shops for aircraft and motor vehicles.
6. Dumps for fuel, ammunition, clothing, rations, etc.

The organization outlined above was also applicable to the Russian Naval Air Force Service Command, but not to that of the long range bomber force. The latter had no district air base depots but only airfield battalions which were an integral part of the long range bomber regiments.

C. Order of Battle and Movements

Since the airfield battalions made daily reports to their district air base depots on the number of serviceable and unserviceable aircraft in the tactical units they were serving, it was necessary for the Luftwaffe SIS to build up an exact order of battle of the Russian Air Service Command in order to make the fullest use of

such intelligence. Such an order of battle, when examined in connection with these daily reports, enabled the SIS to co-relate Russian airfields and tactical units, and to predict movements of tactical units on the basis of airfields under construction.

Radio traffic between airfield battalions and district air base depots was lively, and the locations of airfields could be readily determined from the contents of messages, or by means of D/F.

Reports on the construction of new airfields were of special value since they revealed enemy intentions, and permitted the Germans to prepare for Russian offensives. No Russian offensive ever commenced without very strong air support, which necessitated that airfields be located as close to the front as possible (Russian SOP called for aviation in direct support of the ground forces to be located no more than forty kilometers behind the front; on some occasions these airfields were so close to the front that aircraft on the ground were hit by German artillery fire). The number and density of such airfields under construction were an excellent indication of the time within which an offensive might be expected. Because of the time required to complete these installations, no Russian offensive really took the Germans by surprise.

Radio traffic involving movements of the airfield battalions was likewise very carefully monitored since these afforded clues as to the direction in which the tactical units would later move. The following is an example of this:

The reconquest of the Crimea in the spring of 1944 freed two Russian air armies for further assignment. The German Command was naturally greatly interested as to where these air armies would next operate. A few days later the Luftwaffe SIS

supplied the answer to this question. One airfield battalion had received an order to board a troop train in Simferopol. After the train departed, the airfield battalion sent a radio message to its district air base depot at each stop, reporting its location. Finally Gomel was reached. The Russians naturally had no way of knowing with what anxiety this movement was being followed by the chiefs of staff of two German Luftflotten, one of whom felt greatly relieved when the Russian airfield battalion finally stopped in Gomel, and not, as he had feared, in his sector. It was obvious that the airfield battalion would be followed by tactical units, if not by the whole air army. This assumption was confirmed a short time later when the whole of the Russian 4th Air Army moved from the Crimea to the central sector of the Front.

The new operational area of the Russian 8th Air Army, the second of the two air armies freed for other duties by termination of the campaign in the Crimea, was also quickly determined through the SIS. A message from an airfield battalion was intercepted, which when decoded, read: "The quarters for the 8th Air Army in Tarnopol are ready". Shortly afterwards this air army moved from the Crimea to its new sector.

Not only the Luftwaffe Command, but also that of the German Army was interested in such reports, particularly since the Russian air forces were an integral part of the Red Army, and consequently their transfers could be taken as an indication of imminent moves on the part of the Russian ground forces.

D. Supply

The interception of the radio traffic of the Russian Air Service Command also yielded valuable intelligence on supplies of fuel, ammunition and other materials.

The district air base depots informed their subordinate airfield battalions by radio of all railway movements of supplies. These messages contained the destination, number of cars, amount of supplies, and the scheduled day of arrival. The arrival of the trains at their destination was in turn reported by the airfield battalions. Many Russian railway station commanders may have wondered why German bombs fell on their stations shortly after trainloads of fuel and ammunition had arrived.

A service command point-to-point network on the southern sector reported the arrival of all replacement aircraft for the 17th, 5th and 8th Air Armies which were ferried from the aircraft factories. The distribution of these replacements could be followed in the strength reports of tactical units down to regiments, thus permitting an insight into the aircraft turnover rate.

Pre-arranged form messages transmitted by the airfield battalions yielded information on the current supplies of fuel and ammunition at airfields. These reports also formed an excellent basis for predicting Russian offensives, since supplies of fuel and ammunition on airfields were always increased before the beginning of an offensive.

E. Miscellaneous Intelligence

It was also the task of the Russian Air Service Command to salvage German aircraft which had been shot down, or had made forced landings. Reports on such aircraft, transmitted by radio, afforded much information on missing German aircraft and crews. In many cases it was possible to inform the family of a German soldier or officer that he was not missing but a prisoner of war.

In some instances, reports of the interrogation of German air crews were transmitted, together with the names of the prisoners. This enabled the German Command to instigate immediate court martial proceedings in absentia, where military secrets had been revealed.

An air service command network of the Russian 8th Air Army on the southern sector reported the routes to be flown by Russian aircraft in large-scale ground attacks, also mentioning the time at which such attacks would take place. The air army usually ordered the placing of smoke markers in the frontal area the day before such an attack was contemplated. All Russian aircraft had to fly over these smoke markers, which were used as an orientation point. These smoke signals not only indicated the direction to be flown by the aircraft, but always corresponded to the direction of advance of the ground forces. Through experience, the Luftwaffe SIS learned that these smoke signals were ordered for a time which preceeded the actual time of attack by thirty minutes to an hour. Thus, the German Luftwaffe and Army commands could usually be informed twenty-four hours in advance of plans for such a Russian attack.

X. Air Raid Warning Service

The prolific radio traffic of the Russian Air Raid Warning Service was monitored regularly by the Luftwaffe SIS, and provided the following important intelligence:

a) Reports of German aircraft over Russian territory and their positions.

b) Reports of Russian and American flights over Russian territory. In the case of flights made entirely within Russian territory these included the time of take-off and airfield destination; in the case of flights into German territory, the time the aircraft crossed the front was given.

When German aircraft were observed, especially in the case of long range reconnaissance, it was possible for the SIS to warn them that their position was known,

and to recommend a change of course or evasive action.

When Russian aircraft were reported, valuable information was often obtained concerning impending operations of the Russian long range bomber force; reports of American aircraft often yielded intelligence on the "shuttle flights" and "triangular flights" of the 8th and 15th Air Force.

The first flight of American four-engine bombers over Soviet territory was not reported by the Russian Air Raid Warning Service, which evidently was taken completely by surprise, since, on the following day, many messages to visual observer stations and flak units contained descriptions of American aircraft types and their insignia.

The Luftwaffe SIS was able to indicate Poltava as an airfield used by the American bombers, since for weeks previously the Russian Air Raid Warning networks had on several occasions reported single American Liberators flying from Tabriz over the Caucasus to Poltava. The German Command had at first interpreted these flights as courier flights; but this theory was quickly dismissed since it was known that no Russian higher headquarters were located in Poltava. As soon as the first American bomber formation landed in Russia, the significance and purpose of these previous individual flights were realized, and it was a matter of simple deduction for the SIS to point to Poltava as the airfield being used. Photo reconnaissance, carried out the following morning, confirmed this assumption.

All further American flights were reported by the Russian Air Raid Warning Service, and were in turn intercepted by the Luftwaffe SIS. The following is an example of such a report:

Message:	0800	1100	356	358	374	524	366	374
Meaning:	0800 -	1100 hrs.	1	2	0	Liberators	5	0

Message:	533	465262	0800	444894	0930
Meaning:	Lightnings	Poltava	0800 hrs.	Kirovograd	0930 hrs.

Message:	424513	1100	7600
Meaning:	Tiraspol	1100 hrs.	7600 (altitude in meters)

Thus, from these messages were obtained the time of take-off (0800 hrs.), point of departure (Poltava), the route (Poltava-Kirovograd-Tiraspol), the place and time at which the front was crossed (Tiraspol at 1100 hrs.), and altitude (7600 meters). Similar information was reported on the flights of single Lightnings which preceeded the bomber formations as weather reconnaissance ships.

Since these reports were usually transmitted during the evening preceeding the day of attack, ample time remained for the preparation of German countermeasures.

The first SIS report of this nature met with little credence on the part of the Luftwaffe Command in that sector, which at that time was Luftflotte 4. In an attempt to confirm this intelligence, the Luftflotte sent a reconnaissance aircraft to reconoiter the course of the American aircraft as predicted by the SIS. The reconnaissance aircraft met the American formation at the half-way mark, reported the latter's position and course, flew several hundred meters above the bomber formation, took several fine photographs of it, and then was shot down by two Lightnings. Fortunately, this incident took place over the German lines, and the reconnaissance crew parachuted to safety with their photographs. The only expense to the Luftflotte for its distrust of the SIS intelligence was the loss of a JU-88. However, all future SIS reports on this subject were accepted by the Luftflotte without reserve.

XI. Radar Intercept

Radar intercept on the Eastern Front brought only insignificant results, owing to the rare use of radar by the Russian Air Force. On several occasions, the Russian radars RUS-1 and 2 (radio ulavlivatel samoletov) and MRU (melki radio ulavlivatel) were mentioned in messages intercepted on point-to-point networks, but no other details were revealed.

Several prisoners of war stated that intruder regiments of the Russian long range bomber force used radar against German night fighters. However, no trace of any airborne radar equipment was found in any of the aircraft shot down, and it was concluded that in the case of the statements of these prisoners, the wish was father to the thought. They probably knew that the German and Allied air forces were using such equipment, and wished the same for their own air forces.

XII. Conclusions

It can be stated that the successes of the Luftwaffe SIS on the Eastern Front represented the most important and comprehensive source of intelligence on the Russian Air Force to the German Command.

No Russian large-scale offensive took place, beginning with Stalingrad and continuing up to the breakthrough into East Prussia and Silesia, that was not anticipated by the SIS, and reported to the German Command. Signal intelligence on the organization and order of battle of the Soviet Air Force was so comprehensive that prisoner of war interrogation was able to contribute but two or three percent additional intelligence.

In the last phase of the war, when enemy air superiority and shortage of fuel made aerial reconnaissance impossible, signal intelligence represented the only source of enemy intelligence, and its reliability was unquestioned.

PART TWO

THE RUSSIAN LONG RANGE BOMBER FORCE

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I. Development of the Russian Long Range Bomber Force

Soon after the outbreak of the Russo-German war, practically all of the Russian long range bomber force was destroyed, either by German attacks on Russian airfields, or in combat with German fighters. What was left of it was withdrawn from action. Marshal Golovanov, chief of long range bombers, reorganized his forces with the intention of using them in night operations only, owing to the threat presented by the strong German flak defense. The first successful operations following the reorganization took place in the battle of Stalingrad. From then on, long range bomber operations played an important part in all Russian offensives. The training for the night operations was of long duration; at the end of the war each bomber regiment had crews which were still on a training status.

The long range bomber force was considerably increased in 1943 when each division was split into two, i.e. eight corps were formed from the then-existing eight divisions, each corps comprising two divisions. Another corps was added in 1944. Each division had two regiments, but, by the end of 1944, each division had received a further regiment, partly equipped with the new aircraft type ER-4. However, these new regiments did not become operational until close to the end of the war; and even then they had not yet reached their T/O strength in aircraft and crews.

Apart from the bomber regiments, each corps was supposed to contain a night intruder regiment, which the Russians called a "blocking" regiment. Only two of these regiments actually became operational. They were equipped with "Boston" A-20-G attack bombers, and had the task of "blocking" German night fighter airfields in the target area, thereby keeping the German night fighter defense on the ground. Their secondary mission was to attack German flak installations. The Russian High Command eventually abandoned the creation of further "blocking" regiments, and those already in existence were, in part, reorganized into bomber regiments.

The long range bomber force was very active during the spring and summer of 1944. The aim of the Russians was to force Germany's Axis partners out of the war; terror attacks were therefore carried out against Helsinki, and later against Budapest and other Hungarian cities. For the sake of efficiency all units in the north, and similarly in the south were grouped together tactically, this had the effect of creating two separate bomber forces, although no administrative or organizational changes were involved. As a result, massed operations of 400-500 aircraft at a time took place.

In the fall of 1944, following the attacks on Finnish and Hungarian cities, long range bomber operations were limited to the supplying of guerrilla bands, and the dropping of agents behind the German lines. The bomber force was also used to bring reinforcements to the front, particularly to the Baranov bridgehead sector, from where the next Russian offensive began.

At the end of 1944, a reorganization of the long range bomber force began, with the aim of transforming it into the 18th Air Army (up to that time, the Russian air armies were seventeen in number). During the first two months of 1945, the

eight corps of the long range bomber force were consolidated into four corps and a somewhat nebulous organization called IX Long Range Bomber Corps. In the process those corps with the same aircraft types were combined. The I Guard Corps and VIII Corps were formed into the I Guard Corps; II Guard Corps and III Guard Corps into II Guard Corps; IV Guard Corps and V Corps into IV Guard Corps. The VI Corps was dissolved, and the VII Corps was reinforced by the addition of the 9th Guard Division, equipped with LI-2's. The IX Corps probably remained independent. The term "Guard" had no tactical significance, but was only an honorary title.

At the same time, a corresponding reorganization took place within the service command of the long range bomber force. Until that time, each bomber regiment was serviced by an airfield battalion, which always remained with its regiment even in the event of the regiment's transfer. After the reorganization of the bomber force into five corps, the airfield battalions of each corps were placed under a district air base depot. The 85th District Air Base Depot was identified by the SIS as the higher headquarters of the airfield battalions of IV Guard Corps, and the 84th District Air Base Depot as the superior headquarters of those of the II Guard Corps.

The reorganization resulted in operational orders being given to long range bomber corps and divisions not only by the Long Range Bomber Headquarters in Moscow, but also by headquarters of the air armies at the front. For example, the 15th Guard Long Range Bomber Division (of the IV Guard Long Range Bomber Corps), which was stationed in Hungary, frequently received its operational orders from the 17th Air Army of the 3rd Ukrainian Front. However, in addition, the division could also be used on other fronts where operations of greater strength were intended. Thus it can be seen that the reorganization had effected greater mobility, and with it an increase in operational tempo.

Beginning in March, 1945, radio traffic from an advanced command post of the long range bomber force was intercepted. This headquarters engaged in traffic not only with the long range bomber headquarters in Moscow and its subordinate corps, but also with headquarters of the Red air armies, thus giving additional evidence of the reorganization and incorporation of the long range bomber force into the Russian Air Force as the 18th Air Army.

Apparently Chief Marshal Golovanov did not remain commander in chief. It is not known to what position he was transferred, or who was his successor as commander of the long range bomber force.

II. Organization of the Russian 18th Air Army

At the time of the cessation of hostilities, the Russian 18th Air Army comprised five long range bomber corps, with a total of seventeen divisions and fifty-three regiments. Its total number of aircraft was approximately 1500.(See Figure No. 3)

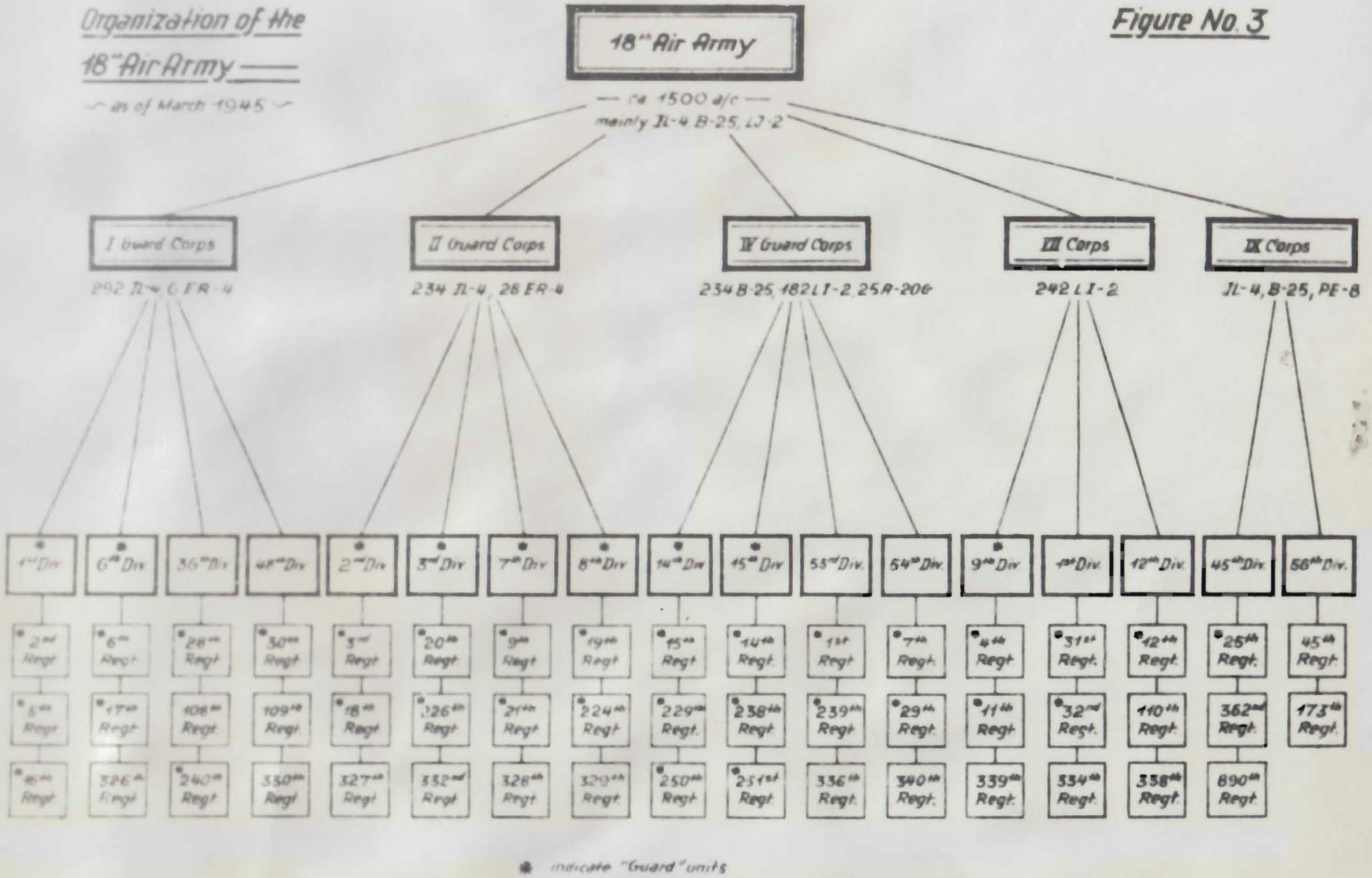
I Guard Corps had four bomber divisions and twelve regiments, eleven of them being equipped with the IL-4, while one regiment, which was just being organized, was equipped with the ER-4. The last known total strength of the corps in aircraft was 292 IL-4's and 6 ER-4's. The regiments were last identified by the SIS as being in the Lidda-Baranovitche sector.

II Guard Corps also had four divisions with eight operational bomber regiments and one night intruder regiment. The latter unit was not mentioned in the last strength report intercepted, and the presumption was that it had been disbanded. Four regiments, equipped with ER-4's were being activated as the war ended. The strength of the corps in aircraft, as estimated by the SIS, was 234 IL-4's and 28 ER-4's. In March, 1945, the regiments moved from the Luzk-Brody sector westward to an area south of Lublin, where they used the airfields at Zamosz, Komarow and Schebeschino.

Organization of the 18th Air Army

~ as of March 1945 ~

Figure No. 3



* indicate "Guard" units

IV Guard Corps, its two divisions equipped with American B-25's, was the most active and most successful of the long range bomber corps prior to the reorganization. In the reorganization it was given two divisions of V Corps equipped with IL-2's, and, from the fall of 1944 until the end of the war, these two divisions were used almost exclusively for transport purposes. At the end of the war IV Corps had seven B-25 regiments, six LI-2 regiments, and one night intruder regiment equipped with A-20 G's. This latter regiment was likewise intended to be re-equipped with long range bombers. One regiment of the corps, which was activated in the summer of 1944, did not fly any night missions, but confined itself to daylight attacks in the frontal area (Breslau). It engaged in missions only on those sectors where no strong defense was to be expected. It was also intended that the regiment should fly with fighter cover, which several times did not materialize on account of ineffectual co-ordination. The final overall strength of IV Corps as determined by the SIS was 234 B-25's, 182 LI-2's and 25 A-20's.

The 14th Guard Division, equipped with B-25's, had moved, near the end of the war, from Kalinovka (north of Vizniza) to Melez (north of Rzeszov). The 15th Guard Division, also equipped with B-25's, had moved, after the capitulation of Rumania, to Rosiorii de Vede, southwest of Bucharest, and remained there on the left flank of the Russian front. In the course of the Russian advances through Hungary, it moved to Koka, north of Belgrade, and thence to Toekoel, south of Budapest. The 34lst Regiment, which only flew daylight missions, and was assigned directly to corps headquarters, moved to Posen, in the latter half of April. The two LI-2 divisions moved from Lemberg to Rzeszov and Krosno in March, 1945.

VII Corps, in the course of the reorganization, received from VI Corps the 9th Guard Division equipped with LI-2's. At the end of the war, the VII Corps

consisted of three divisions of nine regiments equipped with LI-2's. Its total aircraft strength was 242. Its regiments were last determined to have been stationed in the Wilna area.

The fate of the IX Corps was not known to the SIS, although radio traffic of some of its units was still heard toward the end of the war. The corps seemed to have played a special role. Its regiments were not uniformly equipped, some of them having IL-4's and B-25's, but others with the PE-8 four-engine type. The four-engine aircraft had only been used for several attacks on Helsiki, and according to the statements of prisoners of war were being kept in reserve for special operations.

The achievements of the Russian long range bomber units were not very impressive. Crews were not trained for carrying out night attacks in close formation. In the latter days of the war, 60 aircraft of a division needed approximately one hour to take off and assemble, and even this was accomplished only under the most favorable navigational and meteorological conditions. In planning an attack each division was allotted twenty minutes over the target; in that time it was intended that all aircraft of one division should have completed their mission and moved out to make room for the next division. Unless targets on the front itself were being raided, the front line was usually crossed shortly before dark. This permitted the take-off to be made during daylight, and the first aircraft to take off were held in an assembly area in order that a close-flying formation be formed. Formations equipped with R/T communication were again brought into close order by the leading aircraft of the regiments before going into the bomb run. Each regiment had several Pathfinder aircraft, which were flown by the most experienced crews, since the success of the mission depended upon their efforts. In addition to their flares, they usually carried a 1000-lb. bomb.

The performance features of the aircraft used were rather low. The average speed of the IL-4 was seldom more than 250 kilometers, while the LI-2 was still slower. The bomb loads did not exceed 1250 kilos for the IL-4 and LI-2. The B-25's had a speed of 300-320 kilometers, and carried up to 1700 kilos of bombs. The production of IL-2's and LI-4's was being cut back. The SIS did not intercept any technical data on the ER-4, which became operational only during the latter days of the war.

In conclusion it can be said that the Russian Command used its long range bomber units reservedly. One reason was probably that sufficient aircraft were not on hand; another was perhaps that the Russians wished to conserve their air crews for an intended change-over to four-engine bombers. During the war Soviet industry was not in a position to undertake the production of four-engine aircraft, and limited itself almost exclusively to the production of fighter and fighter bomber types for the direct support of the ground forces. Perhaps Russia also counted on being supplied with four-engine aircraft by the western Allies. According to statements of prisoners in the last months of the war, an aircraft industry had been built up beyond the Urals which was devoted to the large-scale production of four-engine aircraft.

III. Radio Traffic of the Russian Long Range Bomber Force

A. Point-to-point Networks

1. General

Point-to-point networks of the long range bomber force were by themselves a sufficient basis on which to build up an accurate picture of its organization. The reorganization of the force into the 18th Air Army was recognized from this traffic. Following the reorganization, the five long range bomber corps maintained

point-to-point communication with the 18th Air Army Headquarters in Moscow, and with its advanced command post in Brest-Litovsk.

The 18th Air Army had good communication personnel which transmitted radio traffic quite accurately using the "bug". The names of the operators indicated that many women were being thus employed.

The corps also maintained direct radio communication with their divisions and any regiments which were directly subordinated to them. Since, however, many units were located in the direct vicinity of corps headquarters, obviating the need of radio communication, radio interception could not give a complete picture of the organization. Traffic between the corps and more distantly located divisions was much more fruitful to the SIS, since operational orders were given by radio and the codes used had been broken. Radio traffic between divisions and their subordinate regiments was almost never intercepted since, in most cases, division and regimental headquarters were in the same location.

2. Call-Signs and Frequencies

Three-character call-signs were used in the radio networks between the 18th Air Army and its corps. They were changed once during the day and again at night when the frequency was changed. The call-signs were an arbitrary combination of numbers and letters, which were selected from a call-sign list changed once a month. Within the course of the month a call-sign used by a given station might be repeated without the succession of call-signs being followed; no definite system could be ascertained.

Each radio link had two day and two night frequencies at its disposal. Night frequencies lay in the band between 3500-4500 kcs; day frequencies between

5000 and 8000 kcs. As the seasons of the year advanced the day frequencies gradually moved up to a maximum of 10,000 kcs.

Radio traffic between corps and division took place with a periodic change of call-signs, but on fixed frequencies which greatly facilitated the SIS intercept task. The frequencies lay within the regular Russian military band of 2500-5000 kcs. Call-sign systems and changes differed from corps to corps, which was an aid to the SIS in distinguishing between them.

3. Messages

Five-figure messages could not be broken, and were only analyzed on a basis of message numbers and delivery groups. In five-figure messages of long range bomber units the next to the last group before the message number was the signature group, which was constant and identified the headquarters of the originator. Each headquarters had a three-digit designation. Two zeros inserted in front of this number completed a five-figure group. This signature group was the most essential characteristic for identifying traffic of long range bomber units, since no other Russian five-figure messages contained these groups. Radio traffic of the long range bomber units was further identified by two address groups in the preamble of the message. These were three-figure groups, which were periodically repeated; one of them designated the unit, and the other the section. In front of the address groups, the symbol "adr" (address) appeared; in front of the signature group "sig" (signum) appeared.

Most valuable were pre-arranged form messages, which all units had to send to their commands, and these were intercepted by the SIS whenever they were transmitted by radio. They contained regimental reports on location, strength, and aircraft serviceability. "Form 1" had to be sent daily by division to corps, and

contained regimental strengths in personnel and aircraft. The numbers were given in the clear but were preceded by two other numbers (nulls), the result being four and five figure groups. The following is an example of such a message:

12238 1350 1436 .... 2332 2430 2502 2629 2728
2801 2903 3002 3101.

After removing the first two figures of each group, the first group indicated the designation of the regiment whose strength was being reported, i.e., the 238th Regiment. The next groups contained data on personnel strength, the details of which however were never definitely determined. The last nine groups referred to aircraft strength, and had to be read in units of three groups. After again removing the first two letters of each group, the first group of three gave the total number of aircraft, followed by the number of those serviceable and those unserviceable (e.g. in the message above, total 32, serviceable 30, unserviceable 2). The second group of three gave the total number of aircraft on the airfield, followed also by numbers indicating those serviceable and unserviceable (e.g., total 29, serviceable 28, unserviceable 1). The last three groups referred to regimental aircraft which had landed at other airfields, again stating which were serviceable and unserviceable (e.g., total 3, serviceable 2, unserviceable 1).

"Form 4" was sent every fifth day by divisions to corps, and by corps to the 18th Air Army. Here again, numbers were given in the clear, slightly camouflaged by a two-digit null in front of each group. The following is an example of such a message:

22250 3246214 42685 5229 6203 7240 .... 1219.

By ignoring the first two digits of each group, i.e., 22, 32, 42, etc., the message could be read. The first group revealed the number of the regiment

(250th Guard Regiment); the second group reported the location of the regiment in a six-figure grid system, which changed every month but was easy to solve. The third group indicated the aircraft type represented by a three-digit number. These three-figure groups changed approximately every ten days, but since they were valid for the whole of the Russian Front, their identification did not present any difficulties. The fourth group represented the number of aircraft serviceable, the fifth group the number of aircraft unserviceable. Succeeding groups gave details as to personnel strength, and these again were not clearly understood. The last group indicated the number of crews ready for operations.

These two types of pre-arranged form messages formed the basis for the Luftwaffe SIS' knowledge of the organization, order of battle, location and aircraft strength of the long range bomber force.

Reports of the results of an operation were also sent by the corps to the 18th Air Army by means of a pre-arranged form message. These contained details as to the number of aircraft participating, the target, time and altitude over the target, the weight of bombs dropped according to type, results observed, German defense, Russian losses, and the weather.

The corps had to make daily reports on the serviceability of the airfields used by its divisions and regiments. The location of the airfield was given by a six-figure grid reference; serviceability was indicated by constant four-letter groups for "serviceable", "partially serviceable", and "unserviceable". These reports afforded the SIS a good picture of Russian airfield serviceability, and of changes in locations.

The use of navigational aids was ordered by the headquarters of the 18th Air Army. Such messages indicated the navigational aid to be used for a

particular day. When these messages were intercepted by the Luftwaffe SIS, they could be taken as a definite indication of a forthcoming raid. If no such message was sent, no attack was to be anticipated throughout that day and night.

The number of Russian weather messages intercepted by the SIS was very great. Their contents were used to brief Luftwaffe air crews on Russian weather. If a "winds aloft" message was intercepted around noon (such messages were easily distinguishable from others), it signified an impending operation by the corps transmitting the message.

Frequently messages from corps to divisions containing operational orders were intercepted. These messages contained details as to target, time of attack, and altitude of attack, affording ample time for the preparation of German countermeasures. The divisions reported the number of aircraft to participate in the attack, as well as the start and finish of the take-off period. This latter information provided a valuable basis to the SIS for flight path tracking.

D/F fixes on stations in the point-to-point networks were seldom necessary as the locations of the long range bomber units were known from the pre-arranged form messages.

B. Air-to-Ground Traffic

1. Call-Signs and Frequencies

The use of call-signs and frequencies for air-to-ground traffic was determined by the individual corps signal officer rather than by a uniform procedure for the whole 18th Air Army. The Luftwaffe SIS considered this a great mistake on the part of the Russians, since it permitted the several corps to be identified on the basis of their signal procedures.

Each regiment, as well as its aircraft, had two frequencies, one for transmitting and one for receiving. The aircraft of a regiment were divided into two groups, each transmitting on its own frequency. In general, the ground station frequencies lay between 2500-3000 kcs., while the aircraft frequencies were found between 3000-3700 kcs. An exception were the aircraft of IV Guard Corps, whose units were equipped with B-25's. These aircraft were equipped with American radio sets, and frequencies between 1800-2500 kcs. were used. The transmitters were probably crystal controlled since frequencies of round numbers (e.g., 1800, 1850, 1900, etc.) were always used.

Call-signs remained valid for several months, and were repeated at irregular five, six or seven day intervals. The regimental ground stations used two or three letter call-signs, while the aircraft had one or two letter call-signs with suffix numbers added. These suffix numbers referred not to the aircraft but to the pilots and were allocated by either the regiment or the division. If allotted by the regiment, they ran from 1 to 32, while in the latter case they reached as high as 100. The regiment also had special tuning and CQ call-signs by means of which each regiment could be identified after a short period.

2. Tuning and Take-Off Traffic; R/T Traffic.

While still on the ground, the bomber aircraft usually engaged in tuning traffic, which was terminated with a "QSA 4" or "QSA-5" procedure signal from the ground station (signal strength). This traffic took place on one of a group of frequencies allotted for this purpose, and was easily intercepted by one of the SIS search operators. Thus, the beginning of an operation was recognized. The cessation of tuning traffic was an indication that the take-off was to begin. In the case of those divisions whose aircraft were equipped with R/T radio

sets, the noise of engines being warmed up could be heard, and served as a source of early warning. In R/T traffic, only the suffix number component of the call-sign was usually used. R/T traffic lay in the band between 4500-5500 kcs.

3. D/F Traffic

Throughout the whole war, the navigational training of long range bomber crews was so poor that "QDM" or "QDR" bearings had to be given them by their ground stations while they were still on their way to the target. This greatly assisted flight path tracking on the part of the Luftwaffe SIS, especially since Russian crews almost always flew straight to the target, and therefore these bearings could be taken as the actual course of the aircraft. This in turn permitted targets to be predicted reasonably accurately. D/F traffic between the aircraft and their ground stations contained no special features, bearings being given in the clear with very little attempt to camouflage. The ground stations of IV Guard Corps used two nulls before a three-figure bearing, e.g., 00252 = QDM 252 degrees. Most of the other corps transmitted the letter "w" three times before a bearing during the outward flight, and the letter "a" before a bearing on the return flight. I Guard Corps transmitted the abbreviation "TRS" before bearings; the erstwhile VI Guard Corps used "QPR" before bearings on the outward flight, and "QPM" during the return flight. These characteristics also served to identify the traffic.

Continual attempts to perfect navigational aids indicated the desire on the part of the 18th Air Army to have its bombers navigate on their own, thus limiting radio traffic during flights to targets, and preventing flight path tracking.

4. Tactical Traffic

The monitoring, over a rather long period, of bomber traffic transmitted during approach flights resulted in the identification of the greater part of this tactical traffic.

As in the case of radio traffic in general, the procedure signals used for this traffic differed with the individual corps. In most cases they were two or three figure groups, sometimes reciphered, sometimes not.

III and IV Guard Corps were liberal in their use of tactical radio traffic. In addition to other less important details, their aircraft reported take-off, flight over the initial point (IPM) and the front, execution of the mission, and observations over the target. Times were given with all these data, and served to complement the SIS picture as derived from flight path tracking. The ground stations often transmitted data concerning the target or time of attack in such cases where changes in plans, for one reason or another, had occurred after the aircraft had taken off. Such data were valuable in determining the most favorable time for putting German night fighters into the air.

C. Flight Path Tracking

1. Data From Messages

When an operational order had been intercepted it was a relatively easy task to track the course of a Russian long range bomber formation. The only problems remaining were to identify the units participating (several corps were often used in one attack), and to make corrections in the predicted time of the bombers over the target by virtue of reported take-off times. After completion of the take-off, the number of aircraft participating and the exact time of the take-off were reported to the headquarters of the 18th Air Army. These messages

served to complement the intelligence derived up to that time from air-to-ground traffic, which at that stage of the operation was not very fruitful. Notification of missions which were planned was usually obtained from traffic of the air defense organization, in which information of the course to be flown over Russian territory was communicated to the flak units. These messages contained the number and types of aircraft, as well as the location of the initial point.

2. Weather Reconnaissance

If no operational order were intercepted, there still existed the possibility of predicting a Russian bomber raid on the basis of weather reconnaissance, which was usually carried out in the target area before an attack. From messages sent by these weather ships, it could usually be determined whether the operation would take place or not. In general, a raid only took place if the ceiling over the target area was no lower than 3000 meters, and there was no more than 6/10 cloud cover. Only toward the end of the war, when the German defense had grown weaker, did certain well-trained units also attack under poorer weather conditions. Flight path tracking of the weather ships was facilitated by the fact that they usually transmitted messages every five to ten minutes, sometimes even reporting their positions, making the taking of D/F bearings unnecessary.

3. Details of Course and Position

The frequent D/F bearings sent by Russian ground stations to their aircraft were likewise of great value for flight path tracking. Since it was customary for the Russian bombers to fly a straight course to their target, their course could be approximated from these bearings. The farther that the Russian bombers worked from their ground stations, the more accurately a target could be predicted. By virtue of these bearings, and the time elapsed since the take-off,

the approximate position of the bomber formation could be determined. Some units even had the habit of reporting their position to the ground station during the approach flight. Such messages were sent in a three-figure reciphered code. However, the reciphering was simple in nature, and was not changed for rather long periods. Almost all units were accustomed to report their time of crossing the front. This also greatly assisted flight path tracking since radio silence usually prevailed once the front line was crossed.

4. Assistance From D/F

The operation of an SIS HF D/F network was a valuable supplement to the other possibilities of flight path tracking.

A suitable D/F control procedure had been developed which obviated any loss of time in giving orders to the D/F's, or in the reporting back of bearings. Communication was by either land-line or radio depending upon the facilities available in any given case. The cryptographic procedures necessary when radio was used occasioned a delay of three to five minutes over those instances where land-line was used.

5. Conclusions

The Luftwaffe SIS had three units on the Eastern Front engaged exclusively in the interception of long range bomber traffic. Each of these stations had a specific area to cover, and followed a Russian bomber formation as long as it was flying through its area. Traffic intercepted by any one of these stations which was found to pertain more to the area of another station, was passed on to the station concerned without delay. After the first wave of Russian bombers had crossed the front line and thereupon observed radio silence, the second wave was followed and D/F'ed. In this way the SIS could warn the German Command of each

successive wave of Russian bombers. Once radio silence went into effect, radar intercept stations attempted to follow the bomber formation from then on.

D. Flash Reports

Tactical intelligence resulting from the interception of Russian long range bomber traffic, such as operational orders, etc., was immediately enciphered and forwarded by wire to visual observation posts, and to the Luftflotte, Jagddivision, and Flak Divisions concerned, as well as to the ZAF, the central Meldekopf for the defense of the Reich. As a result of early warning through these flash reports, German defensive preparations against an anticipated Russian night raid often took place during the morning preceeding the raid.

As soon as the take-off of a Russian bomber formation was established, a wire line from the SIS evaluation company to fighter and flak headquarters was kept open, and all subsequent information currently reported. Another direct line was maintained to the nearest SIS radar intercept station, which was kept informed of the course and altitude of the Russian bomber formation, so that it could take over when Russian radio silence was imposed.

PART THREE

RUSSIAN RADIO PROCEDURE

By

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I. General Characteristics

A. Transmission of Messages

The bulk of Russian W/T traffic comprised messages containing numbered code groups. These were further subdivided into 2, 3, 4 and 5-figure groups; messages of mixed groups, such as pre-arranged form messages, ETA and ETD messages; and weather messages involving the use of "X" groups.

In the early days the transmitting speed of Russian operators was very slow, and the operators were prone to make mistakes. Later, owing to an increase in the volume of traffic, training courses, and practical experience gained during the course of the war, their speed was increased. At the end of the war, the average speed of a Russian operator was 16-18 words per minute. In the case of those operators on more important point-to-point networks, the average was 25 words per minute.

B. Procedure Signals

International "Q" and "Z" groups were used as procedure signals. It also seemed probable that Russian operators had in many cases been trained by British instructors, since certain well-known British abbreviations were used as; ok, pse, for, fm, tks, etc. Certain amateur radio procedure was also used (73's and 88's).

As a separator signal between call-signs, the Russians used both "de" and "a". The letter "r" was used as a break sign between numbered groups, while in clear text messages a comma was employed. In networks of higher headquarters no break sign was used, the only indication being a pause after a word or code group had been completed.

C. Radio Discipline

Intercept operators of the Luftwaffe SIS had little difficulty in re-identifying Russian networks which had undergone frequency or call-signs changes, since lack of security in tuning traffic almost invariably enabled networks to be recognized again.

When shifts were changed, Russian operators (both male and female) were often guilty of breaches of security which were most helpful to the SIS. For example, the following message was on one occasion intercepted:

> "This is Mishka, how did you sleep? We could not decode the third group in your message number 25 of last evening. You must transmit it again."

Thus Mishka and his request for the message to be repeated allowed the SIS not only to identify the network, but also to obtain a previously intercepted message enciphered in a new key.

Russian operators who exchanged personal gripes often furnished a valuable insight into Russian morale. Some operators were even so obliging as to inform another operator of the new frequency that he would be working on at a given time.

Russian lapses in radio discipline often led to valuable intelligence. On one occasion a dearth of radio traffic from a sector of the Leningrad Front had led the SIS to believe that an offensive was being planned by the Russians. The

identity of combat aviation units based on the front was known, and therefore when messages were intercepted containing names of escadrille leaders, and giving them instructions, it could be established that these units formerly on the Leningrad Front had been moved to the Karelian Front (Finland). This intelligence was gleaned even though a complete change of call-signs and frequencies had been effected.

II. Special Characteristics

A. Call-Signs

The call-signs of all Russian ground stations were composed of three-character letter or letter-number combinations. An exception were the fixed four-letter call-signs used by several transport networks (for example "RBFU" in the 17th Air Army area). For the greater part, these call-signs were derived from a call-sign book used by the Red Army since April, 1944. To form call-signs, all letters, including the diphthongs "ue", "ae", and "ch", as well as numbers from one to nine, were used. However, the letters "e", "q", "r", "u" and "z" were never used as the first element of a call-sign. The book itself comprised pages which contained 1000 call-signs each. Call-sign changes were carried out at irregular intervals, sometimes daily, sometimes after longer periods.

When headquarters and units moved in echelons, a suffix was added to the call-signs, for example, "HKM" (rear), "HKM-1" (advance).

B. Cover Names

Cover names, such as "rosa", "rubin", etc., were used quite generally to conceal the identities of units, localities, proper names, airfields, etc., and could be found in different parts of the message.

C. Proper Names

The use of proper names often led to the identity of particular Russian traffic. Statements of prisoners of war, Russian communiques, and press reports often served to confirm the identification of these names. District air base depots and airfield battalions used the names of unit commanders in the clear as signatures to messages, or within the text of messages.

D. Preambles

Messages of the PVO units could be recognized from their preambles alone. Three 2-digit cover numbers, and the abbreviation "VZD" (vozduch = air) were used in the preamble; on other occasions a 3-digit cover number, followed by the abbreviation "MU", and at the end of the message "LJ". The text of the messages usually contained 5-figure groups interspersed with 6-figure PVO grid references.

E. Message Number Sequence

Messages were numbered consecutively, and these numbers could often be used to identify traffic. They were usually the last group in the message.

PART FOUR

RUSSIAN AIR FORCE R/T TRAFFIC

By

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I. Russian R/T Traffic

A. Introduction

Interception of Russian R/T traffic by the Luftwaffe SIS did not begin at the outbreak of the war with Russia, since this means of communication was not used by the Russians until relatively late. The first experiments in the interception of this traffic in the summer and fall of 1942 brought no positive results. However, some success was achieved during the winter of 1942-1943. Systematic interception of Russian R/T traffic on the whole of the Eastern Front began in the spring of 1943. From this time on steadily increasing success was obtained.

B. Russian Air Force R/T Networks

1. Point-to-Point

The Russians employed R/T in their point-to-point networks in increasing volume, particularly on the northern sector. It was used in some cases to replace W/T traffic, messages being spoken in cipher.

2. Air-to-Ground Networks of the Air Armies

R/T traffic was used almost exclusively by the fighters, fighter bombers, bombers, and reconnaissance aircraft of the Russian air armies located near the front. Each type of aircraft used a different network. There were

accordingly in each air army from two to six R/T networks, which had a common call-sign system, and whose frequencies were rotated according to the same plan. The establishment of networks on this basis rather than by units, was probably due to the fact that when each regiment had its own R/T network there had been a great deal of interference. Such interference persisted even after the networks were established on an air army basis. An allocation of frequencies from the top had obviously not taken place, since it was often found that neighboring units were using the same frequency, thus causing mutual interference.

Despite an overall similiarity, each air army displayed its own characteristics in R/T traffic. Radio discipline also varied considerably among the different air armies.

3. Air-to-Ground Networks of the PVO's

The networks of the Russian air defense units were established on a geographical basis, and existed for the most part between ground controls and fighters; later also with night fighters. The Russian night fighter defense however was only in its embryonic stages, and little impetus to its advancement was given by the German Luftwaffe, since night bombing attacks on Russian territory were very rare.

C. Call Signs

1. General

As call-signs, the Russians used easily pronounceable nouns and geographical names. These were tabulated on charts, some of which were at various times captured by the Germans. These charts also contained an abbreviation of an R/T call-sign to be used for W/T traffic (e.g., Mramor = MRA).

All attempts to find a system on which the use of these call-signs might be based resulted in failure. Occasionally, however, certain systematic tendencies were noted, such as the use of names of birds for fighters, or names of fruits for fighter bombers.

On the average, call-sign procedure was completely changed within all air armies within every two or four months. Three to six different procedures existed for each different period, and most of the air armies changed their R/T call-signs every four to ten days. Frequencies were usually changed at the same time as the call-signs.

2. Ground Station Call-Signs

Only a small number of ground station call-signs were allocated to higher headquarters, since these seldom participated in R/T traffic. However, they did enjoy the prerogative of listening to operations on air-to-ground channels, and occasionally requested an air situation report.

Communication with tactical aircraft was maintained by the regimental ground control only. In exceptional cases the transmitter was located at the airfield rather than at regimental headquarters. Usually, regimental ground control stations used the same call-sign as their division, adding a number suffix. However, at times they used entirely different call-signs. Three patterns for the use of regimental call-signs are shown below:

	Type 1	Type 2	Type 3
Fighter Bomber Division A	gratsch 1	ssudak	mamont
1st Regiment	gratsch 2	ssudak 1	aist
2nd Regiment	gratsch 3	ssudak 2	gratsch
3rd Regiment	gratsch 4	ssudak 3	ssokol

	Type 1	Type 2	Type 3
Fighter Bomber Division B	gratsch 5	balyk	fregat
1st Regiment	gratsch 6	balyk 1	drakon
2nd Regiment	gratsch 7	balyk 2	platina
3rd Regiment	gratsch 8	balyk 3	palya

Each air army had about five mobile control stations, which operated at distances from five to thirty kilometers from each other in sectors of great activity. These stations could also be distinguished by the number suffixes added to their call-signs. They maintained R/T communication with fighters and fighter bombers in the frontal area, informing them of the air situation, and controlling their operations. The SIS was usually able to determine the location of these stations by breaking grid encipherments, through D/F bearings, or through the names of localities which were sent in the clear.

Control stations in the air defense zones to the rear were more numerous. They were usually located along railway lines, and their call-sign suffixes were numbered consecutively.

3. Aircraft Call-Signs

Frequently fighter pilots were called by their last names rather than by their normal call-sign. This practice was strictly forbidden according to Russian signal procedure, and pilots were frequently reprimanded by the ground stations. The practice of using family names was not an advantage to the SIS, because although the names of pilots of the various units could be compiled quite completely, the complicated Russian names were usually garbled. Moreover, many pilots had the same name, and therefore it was dangerous policy to conclude the identity of a unit from the name of a single pilot. Commanders of units were usually given several code names to be used at random in order to prevent their units from being easily identified.

In addition to individual call-signs for aircraft, and the use of pilots names, there were also collective call-signs for each type of aircraft. The following is an example of this:

malinki (little ones)	fighters
gorbati (humpbacks)	fighter bombers
yaki	Yak 1, 3, 7
cobri	Airacobra

In addition each air army had more specific collective call-signs for its own fighters, fighter bombers and bombers. These call-signs were generally used without suffix numbers, and were employed for the most part by control stations, which did not know the unit call-sign of the aircraft with which they were in contact. German aircraft were referred to as either "Me" or "Fokker".

Number suffixes were often used to designate aircraft. In the call-sign "Bambuk 3/27", "Bambuk" signified a division, "3" a regiment of this division, and "27" an aircraft of the regiment. Although variations of this system were used, this was the most common procedure.

D. Operational Traffic

Front line bombers, fighters, and fighter bombers often used phrases such as the following: "Follow course", "close up more", "be careful", "don't stay behind", and "Wait for Arbus 3 and fly with him". There were also certain phrases used especially in traffic with fighter escort, such as: "Fly slower", etc.

Many of these phrases were also used during practice flights, and these could only be distinguished from operational flights by D/F. Practice flights were very common during periods of preparation for large-scale offensives.

Flights involving transfers of units also constituted a similar problem since the type of activity could not be recognized in advance.

R/T traffic was particularly lively near the front, where formation commanders could be heard giving instructions to their aircraft: "Attack again from the left". "Enemy fighters behind you -- careful". "I am going into the clouds". Such traffic gave a realistic picture of the tactics and operations over the battlefield area, as well as an insight into the mentality of Russian pilots. However, this traffic did not represent a source of early warning since it usually did not commence until the front line was reached.

Instructions to the fighters of rear area defense units were usually given as follows: "One JU-88 in square 267, course 90, altitude 4000, Follow".

"JU-88 from point 20 to point 13, altitude 5000, go to point 19 and wait there".

Flights of two fighters or fighter bombers were commonly used for close reconnaissance. These reported their observations to a ground control station during the flight. Although D/F bearings could be obtained on them by the SIS, these were of little value as German fighters were unable to overtake them owing to their superior speed.

Long range reconnaissance aircraft, mostly PE-2's, operated singly. They formed a separate reconnaissance network with an air army, and reported their observations during a mission either by R/T or W/T.

E. Signal Equipment

Russian fighters and fighter bombers were at first equipped with the RSI 3 radio set, and later with the RSI 4. The frequency range of these sets was from

3500 to 6000 kms., but the band from 4000 to 4800 kms. was used almost exclusively. Aircraft transmitters had a range of more than 250 kilometers (and could be easily D/F'ed over the same distance); reception was extremely loud and clear within 80 kilometers.

From the point of view of the German SIS, Russian R/T ground stations could not be heard for D/F purposes at distances less than 80 kilometers, between 80 and 250 kilometers reception was good; but between 250 and 350 kilometers the stations were barely audible; they were clearly heard once more at distances of 500 kilometers.

Bombers used a different type radio set with facilities for both R/T and W/T, as well as for D/F. Frequencies used were similar to those of fighters and fighter bombers.

II. SIS Liaison and Co-operation With Other Units and Headquarters

A. With German Fighter Units

It was common practice on the part of the Luftwaffe SIS on the Eastern Front to establish R/T out-stations on the airfields of German fighter Geschwader or Gruppen. Their most important task was to warn the fighter control stations which they served of impending Russian air activity. The average time for the advanced warning that could be given was:

Ten to fifteen minutes for Russian fighters based near the front.
Fifteen to twenty minutes for fighter bombers.
Up to fifty minutes for bomber formations.

If take-off traffic was not intercepted, the time interval in all cases was less.

Another important function of these R/T out-stations was to orient the fighter controls which they served on the current air situation. This was done regardless of whether German fighters were to be airborne to meet the Russian units or not. Periodic reports were also prepared for the German fighter units, setting forth conclusions on enemy tactics, mentality and morale, derived from the R/T traffic. These summaries were read with great interest by commanders and pilots alike.

B. With German Long Range Reconnaissance Units

1. Fighter Warning Service

SIS out-stations were also located on the airfields of German long range reconnaissance units for the purpose of warning these aircraft, when they were on missions into Russian territory, of impending activity on the part of Russian fighters. As in the West and South, the two prime sources of this intelligence for the SIS were R/T traffic messages from Russian fighters, and the Russian Air Raid Warning Service. Such warnings from the SIS out-stations were passed to the German reconnaissance aircraft by their own ground stations.

2. Airborne R/T Interceptors

Similar to the West and the South, attempts were made in the East to use airborne R/T interceptors as members of the German long range reconnaissance crews. These experiments proved a failure, and after several losses were incurred, their further use was forbidden.

C. With German Tactical Reconnaissance Units

Luftwaffe front line reconnaissance units had frequently asked to have SIS R/T out-stations located at their bases. These requests were always refused since experience had shown that sufficient timely intelligence could not be derived to warrant setting up out-stations with these tactical reconnaissance units.

D. With German Flak Units

The SIS was able to offer but little assistance to German flak units. Closer co-operation between the two organizations was desired, but the differences in operations would not permit it.

E. With the German Air Raid Warning Service

A spirit of competition always existed between the SIS out-stations and the German Air Raid Warning Service. Both had the same task, i.e., to recognize and report Russian air activity, and each complemented the other. An SIS R/T out-station invariably maintained close liaison with the nearest air raid reporting station, and intelligence of mutual interest was exchanged.

F. With German Radar Stations

Co-operation between the SIS R/T D/F stations and German radar stations brought excellent results. The radar stations were able to furnish many valuable hints and suggestions to the SIS out-stations, and vice versa. Both services were in a position to assist ground control stations in vectoring German fighters on to Russian aircraft.

G. With Higher Headquarters

In addition to tactical intelligence, there was also a great deal of strategic information to be derived from Russian R/T traffic. Such information comprised identification and location of Russian units, their strength, and their tactics. The Fliegerkorps and Luftflotten, which were primarily interested in this strategic intelligence, did not receive it directly from the R/T out-stations, but rather from the regimental evaluation company, where the traffic was carefully analyzed and prepared into special reports.

PART FIVE

RUSSIAN CRYPTOGRAPHIC SYSTEMS

By

Captain Holetzko, C.O. 1st Co. SIS Regt. 353

And

Lieutenant Sann, 1st Co. SIS Regt. 353,

I. General

The Luftwaffe SIS had been working on Russian Air Force codes ever since 1937, including the time of the Russo-Finnish campaign where simple versions of the 2-, 3-, 4- and 5-figure codes were used. Throughout the Russo-German war these codes were improved and became more complicated. As this was a gradual and logical development, the SIS was able to keep abreast of changes. The signal officers of each air army were given considerable independence in cryptographic matters, although a particularly happy invention of one might gradually be adopted by the others.

II. Two-Figure Code

The basis of this code was a large square, subdivided into one hundred smaller squares. These smaller squares comprised the vocabulary, a number, letter, or phrase being inscribed in each square. Messages were encoded by reading the co-ordinates of the small squares in terms of two figures.

The code was used mainly by front-line units and presented very little difficulty to the Luftwaffe SIS from the cryptanalytic standpoint, even at times when the number co-ordinates of the small squares were re-shuffled daily.

III. Three-Figure Code

A. Construction of Code Book (See Figure No. 4)

Figure No. 4 shows the code book open at the first page. Each page was divided into four quarters designated by number (3, 5, 2 and 7); one of these numbers was used to form the first digit of all three-figure groups, the number used depending upon in which quarter of the page the desired word was to be found. The second digit of the three-figure group was taken from the appropriate line in the center strip. This strip was removable, and was used for each page of the book. The third digit of the three-figure group represented the page number on which the word was to be found, the page numbers being shown on the thumb index. The order for encoding, then, was:

1. Quarter number
2. Line number
3. Page number

Examples:

Attack	351
Bomber	201
Company	521
Direction	711

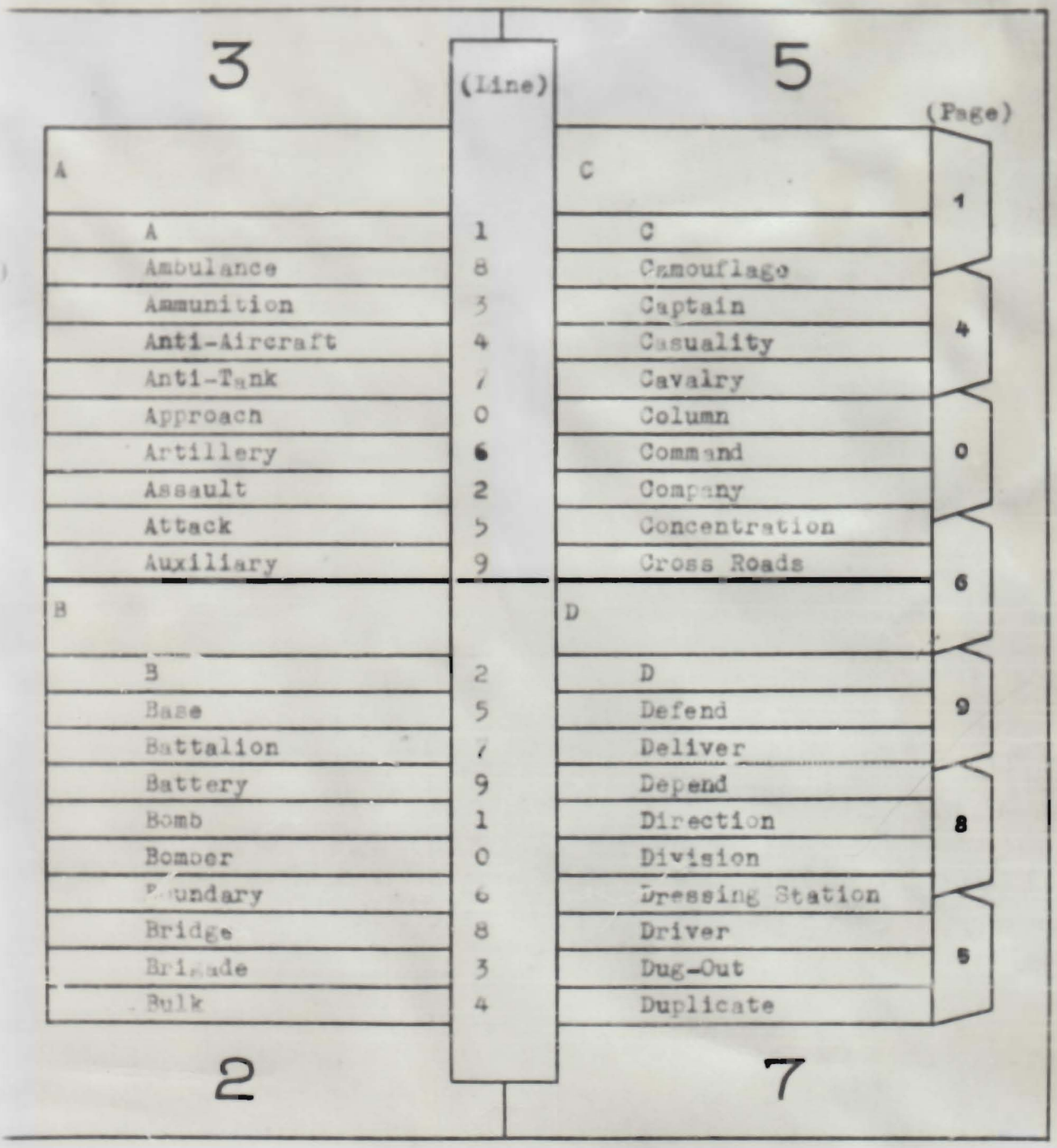
All encoded groups containing words from this page ended in the figure "1"; from the following page in figure "4", etc.

B. Variations

The basic vocabulary, in Russian alphabetical order, remained constant. The figure designations used for encoding, however, were changed every ten days

3 - Figure Code Book

Figure No. 4



according to a table similar to that shown in Figure No. 5. The new quarter numbers and page numbers were obtained by taking the figures in row "a" and writing them in the code book, clockwise, beginning in the upper left-hand corner. Column "b" was used to replace the top ten figures of the center strip, and column "c", beginning from the bottom, to fill the lower half of the center strip. For the next ten-day period, row "d" and columns "e" and "f" were used, and so on.

C. Recipherment

The 5-figure code became increasingly difficult for the SIS, owing to the introduction of more and more complicated reciphering devices. At first the code had been used un-reciphered; then the first figure was reciphered; and later the second and third. There followed a system of reciphering by combining two, or all three figures. An added obstacle came with the use of code groups for "read letters" and "read figures". Similarly, from a regular change in the use of a particular reciphering table, the Russians went over to a random change, and later, through the use of indicators, could change the table for each message.

IV. Four-Figure Code

A. Construction of Code Book

This code book had 1000 basic meanings. The first two digits of a 4-figure group were a reference to page, the second two digits to a line within the given page. The vocabulary was scattered, although alphabetical within blocks.

B. Recipherment

Until the beginning of 1942 the sole form of recipherment was a fixed additive, appended to the first two digits (page number). The next step was the recipherment of the last two digits, either singly or together. This meant that now the whole 4-figure basic group was reciphered, but with each of its occurrences

in the cipher text the same 4-figure group always had the same meaning. Since the reciphement system changed on a time basis, the use of indicators in the messages was unnecessary.

C. Analysis and Obstacles

A great aid to the Luftwaffe SIS in breaking these messages was the possibility of identifying Russian units using the code from other signal intelligence sources. This, coupled with a knowledge of the habits of such Russian units and what they were likely to say in messages, greatly facilitated analysis of the 4-figure messages. Of additional assistance were words and suffixes occasionally given in the clear.

As with the 3-figure codes, the introduction of groups for "read letters" was a distasteful development from the German point of view. It meant that the Russian code clerk, to spell out a word, did not use groups for the individual letters, but rather the group for any word beginning with the letter he wanted to spell. This innovation destroyed the value of any frequency count for "spellers", but the laziness of Russian cryptographic technicians, who clung for a time to the old single letters, lessened the blow.

The next obstacle placed in the path of the Luftwaffe cryptanalyst was the abandonment of the time basis for changing reciphement tables. By employing an indicator a different table could be used for each message. In time, this became so complicated for the Russians themselves that discriminants had to be added.

With these refinements in the 4-figure system there came an increase in the care and security given to its use, with the result that towards the end of the war several months' depth of traffic was usually required to develop a satisfactory entry.

D. Use

Since the number of reciphering possibilities of a 4-figure code is considerably greater than in the case of a 3-figure code, the Russians were quick to realise the superior security of the former. At the end of the war, of the thirty-six separate codes in use on the northern sector, twenty-five were 4-figure, and only nine were 3-figure. At the beginning of the war this proportion had been reversed.

Like 3-figure, the 4-figure system was used above division level, and only in exceptional cases did regiments possess this code. On the northern sector the point-to-point networks of the tactical air units became, to a great extent, merged with those of the ground forces. This tended to increase cryptographic and signal security. Although new reciphering systems often appeared first on the southern sector, closer adherence to regulations made those on the northern sector the more difficult to break.

V. Five-Figure Code

A. Description of System

In the 5-figure system the Russians used a basic vocabulary, assuming the proportions of a dictionary, for converting clear text into 5-figure groups; and a one-time reciphering sheet of one hundred random 5-figure groups, which, taken in order, were added to the basic 5-figure code groups. The result was the cipher text as transmitted. A one-time pad contained fifty of such one-time sheets, each sheet bearing the same 5-figure serial number assigned to the pad. Each sheet was additionally numbered from 1 to 50.

B. Cryptanalysis

Since this system was based on the use of one-time pads, it was incapable

of solution in the field. Accordingly, all cryptanalytic work on it was done by the Russian section of Referat E of the Chi-Stelle. Even the specialists of this section could report any progress only at such times when the same reciphering sheets had been used three or more times. The procedure in such cases was to compile an index showing number differences between the most commonly used words in the basic book which had been captured.

C. Traffic Analysis

Although 5-figure messages could not be read, they were nevertheless of assistance in the field of traffic analysis. The following aids to recognition of units occurred in the messages:

1. A 5-figure group found among the first five to seven groups of the message would be the actual number of the one-time pad used. This group would remain constant for fifty messages.

2. A further 5-figure group, usually within the first seven groups of the message, but always following the one-time pad number, would contain, as its last two figures, the number of the reciphering sheet (1 to 50) used. The middle figure of this group indicated the organizational level, e.g., "6" might represent corps forward to division, or "5" division to division.

3. The last 5-figure group of the message was its serial number, starting with 00001 and continuing indefinitely, regardless of change in one-time pad numbers.

Example:

57816	24835	61284	96358	53984 (one-time pad no.)	23781
47627 ("6" = organizational level) ("27" = reciphering sheet no.)	.....	.....	.....	00841 (message serial no.)	

VI. Special Three-Figure Code

From March, 1944, until the end of the war, the Russian Air Force used a special 3-figure code for short reports. It contained groups for the figures 0 to 9, aircraft types, and units. Occasionally these code groups would be inserted in normal 3-figure or 4-figure messages, and were of great assistance to the German cryptanalyst. The special code was reciphered weekly by applying a fixed additive, and for the most part presented very little difficulty to the SIS.

PART SIX

MISCELLANEOUS ITEMS

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I. The "Rose Beacon"

As navigational aids for their aircraft, the Russians used commonly known types of circular radio beacons of both light and heavy design; radio broadcast with recognition signals interspersed throughout the ordinary transmissions; and the so-called "Rose Beacons".

Ordinarily a pilot used his radio compass to orient himself with the circular beacon. However, if he so desired he could orient himself by means of the "Rose Beacon", which did not require the use of the radio compass.

The "Rose Beacons" worked on a frequency of 250-600 Kcs., and consisted of 16 beamed antennas, spaced equally throughout a 180° arc.

A prescribed letter was automatically transmitted from each of the antenna in consecutive order by a high-powered transmitter in the center of the installation. It required 32 seconds for a complete keying, each separate letter being transmitted over a period of two seconds. The antennas were narrowly beamed and therefore very directional. When tuned to a "Rose Beacon" station, the pilot would hear the 16 letters in succession, at varying intensity owing to the directional properties of the transmitting antennas. After transmission of the 16 letters was completed, a double-letter character was transmitted as beacon identification before the 16 letter transmission was repeated.

In the case of the "Rose Beacon" the pilot would orient himself in the following manner:

1. He would listen for the loudest signal (letter), knowing that this maximum signal was being transmitted by the antenna beamed directly at him.

2. He would then listen for the weakest signal, knowing this minimum signal was beamed at an angle of 90° from him.

3. From the double-letter transmission he could identify the beacon by reference to a list of beacon identification signals.

4. By knowing the position of the maximum and minimum signal, he could then plot a course to his destination.

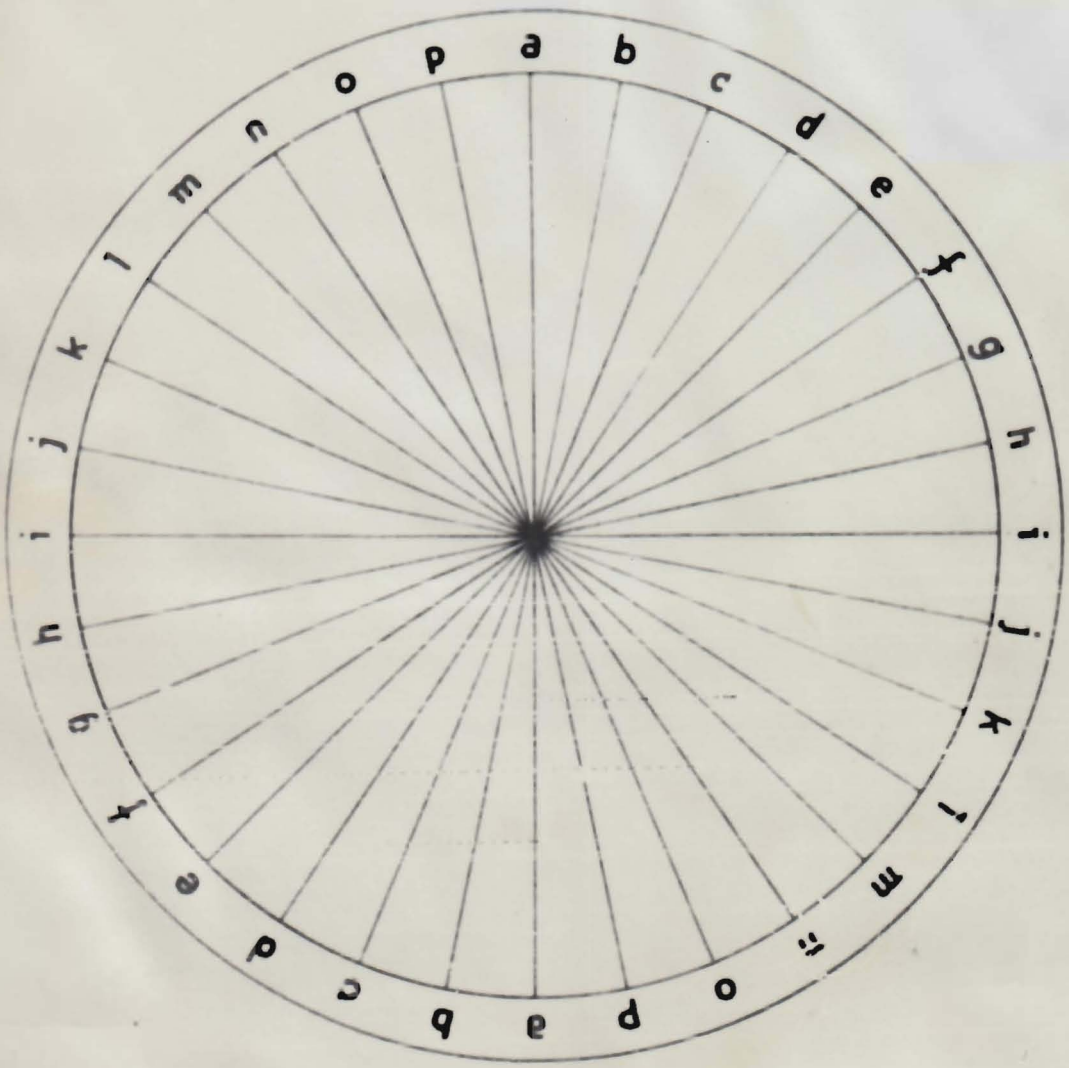
5. By orienting himself with respect to a second "Rose Beacon", the pilot could fix his position.

For a copy of the "Rose Beacon" chart carried by Russian pilots see Figure No. 6. This chart was a transparent disk, which could be used as a map overlay. After identifying the "Rose Beacon" heard, the pilot or navigator could place the center of the disk on the map location of the beacon, with the letter "a" pointing to the north. By drawing a line through the letter on the disk representing the signal of maximum strength, he could obtain a line bearing to the location of the beacon. By repeating this process with the maximum signal from a second beacon, he could determine his actual position from the point of intersection of the two line bearings.

There were twelve to fifteen "Rose Beacons" located throughout the interior of Russia, each having a range of 1200 kilometers. One of the best known to the

Rose Beacon Disk

Figure No 6



Luftwaffe SIS was that located at Monino near Moscow. Toward the end of the war other beacons appeared using 18 letters in the pattern.

Identification letters were not changed frequently since such changes would not have served to conceal the location of the beacons. No reliable connection could be established by the SIS between the times of operation of these beacons and the attacks of Russian long range bombers. Data on the "Rose Beacons" were furnished to German tactical units by order of the Chief Signal Officer, and were occasionally used by them for navigational purposes. On the whole, German pilots and navigators considered them unreliable and preferred to use German navigational aids.

II. Ground Radar

In the summer of 1943, the Luftwaffe SIS established from R/T traffic that the Russians were experimenting with ground radar in their air defense zones (PVO's). Three or four radar intercept teams with D/F equipment were placed along the front by the Luftwaffe SIS. Intelligence derived from this monitoring indicated that the Russians were making very little progress in the field of radar, and that their equipment was far inferior to that of Germany or the western Allies. In the fall of 1944, it was determined that on the central sector, apart from several small radars which were apparently being used for flak control, there was only one large installation, and that in the vicinity of Warsaw. R/T traffic indicated that there were several other Russian radar installations within the air defense zones, but the location of these could never be plotted by D/F.

III. Captured Material

A. Radio Equipment

A plethora of Russian signal equipment was salvaged from aircraft which were shot down on the Eastern Front. Since, however, all types of Russian radio

sets were known to the Luftwaffe SIS, and changes were very few and far between, this material did not represent a great source of interest.

B. Documents

A wealth of information was obtained from SOI's, pencilled notes, and signal documents in general, which were taken from captured Russian aircraft and air crews. All German units were instructed to turn over any such material retrieved to the Luftwaffe SIS without delay. Much important information on codes, frequencies, and call-signs was obtained, as well as copies of maps, and grid-square enciphering systems. Such data greatly facilitated SIS evaluation work, and in most cases provided gratifying confirmation of previous signal intelligence. The Luftflotten, as well as other Luftwaffe and Army units, co-operated splendidly in expediting this material to the hands of the SIS.

IV. Prisoner of War Interrogation

Verbatim statements of all Russian PW's taken at interrogation centers came directly to the SIS, and an evaluation was made as to whether the statements were truthful as to name of organization, number of personnel, intended movements of the organization, etc. For the most part the statements of the PW's were true; however, through efficient checking and evaluation a lie could be detected and pointed out. Signal personnel, or fighter pilots who handled their own radio communication were interrogated directly by the SIS evaluation companies, or by chiefs of the out-stations in whose area they were captured. During interrogation every effort was made to determine the type of propaganda to which the prisoner had been subjected. The universal opinion of the Russian pilots was that they would be shot by the Germans and they often asked that it be done quickly. To the Germans, the belief of the Russian pilots was not at all strange, as they were

given to understand that the Russians always shot German prisoners after capture and interrogation. This fact was conclusively proved by intercept of Russian ground force networks by the German Army SIS, sample messages reading: "Before you liquidate the prisoners, you must interrogate them", or "We cannot send you the prisoners as we have already liquidated them", or "If you liquidate the prisoners be sure and save the 1st Lieut. as he is to be interrogated further", or "Don't liquidate all the prisoners as we need them for labor", or again "Shall I liquidate all the prisoners? There are too many here". Answer: "Yes, the swine must all disappear". It is only natural that the Russian pilots expected to be shot when captured, as their daily propaganda stressed this point. After the prisoners had seen for themselves that they would not be shot, they became bitter over having been subjected to false propaganda, and were often most co-operative, in many instances furnishing valuable information.

One gained the impression during an interrogation, that the extreme security practiced by the Russians was occasioned by great distrust of one branch for another within the Russian Forces. The short period of training, and low mental capacity of the Russian soldiers must have been another reason.